U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-265 418

Incentives for Research and Development in Pest Control Volume II. Appendices

Arthur D. Little, Inc, Cambridge, Mass

Prepared for

National Bureau of Standards, Washington, D C

Dec 76

EPA – 540/9-77-006

PB 265 418

INCENTIVES FOR RESEARCH AND DEVELOPMENT IN PEST CONTROL

VOLUME II

APPENDICES

DECEMBER 1976

FINAL REPORT

REPRODUCED BY
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SPRINGFIELD, VA. 22161

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
WASHINGTON, D.C. 20460

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National Technical Information Service
Springfield, Virginia 22161

BIBLIOGRAPHIC DATA SHEET

1. Report No. EPA-540/9-77-009

2\.

3. Recipient's Accession No.

4. Title and Subtitle
Incentives for Research and Development in Pest Control
Volume II Appendices

5. Report Date December 1976

6\.

7. Author(s) Alfred E. Wechsler, Joan E. Harrison, Alan Burg, Donald Gibbons, Joanne Perwak, Robert Terry

8. Performing Organization Rept. No.

9. Performing Organization Name and Address
Arthur D. Little, Inc.

10. Project/Task/Work Unit No.

11. Contract/Grant No.
68-01-3133

12. Sponsoring Organization Name and Address
National Bureau of Standards , Experimental Technology Incentive Program and
Environmental Protection Agency, Office of Pesticide Programs,
Strategic Studies Unit, Washington, D.C. 20460

13. Type of Report & Period Covered

14\.
Code 500/01

15. Supplementary Notes Frederick W. Talcott, Project Officer

16. Abstracts

Industry, the principal innovator and developer of pest control methods, feels that existing economic, technical, and regulatory barriers can significantly inhibit the development of new pest control products. The federal government desires to reduce or eliminate these barriers, without compromising its congressionally mandated goals of preventing unreasonable adverse effects of pesticides on humans and the environment. The purpose of this program is to identify, develop, and evaluate incentives (externally applied influences) that the federal government can offer to reduce these barriers and thereby encourage the continued development of pest control methods by industry.

17. Key Words and Document Analysis. 17a. Descriptors

- research and development
- pesticides
- economic incentived
- pesticide innovation
- history
- incentive framework
- final incentives
- minor use pesticides
- integrated pest management
- regulatory hindrances to R&D
- government support of basic research
- information & training for users
- lengthen patent life
- improved communications
- advertise safety on product label
- reduce risk of product development

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group

18. Availability Statement

ia

19. Security Class (This Report) UNCLASSIFIED

20. Security Class (This Page) UNCLASSIFIED

21. No. of Pages 232

22. Price

FORM NTIS-35 (REV. 10-73) ENDORSED BY ANSI AND UNESCO. THIS FORM MAY BE REPRODUCED USCOMM-DC 8265-P74

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EPA- 540/9-77-009

Contract 68-01-3133

ACKNOWLEDGMENTS

This program was conducted by Arthur D. Little, Inc., under EPA Contract 68-01-3133. Dr. Alfred E. Wechsler was the project director, Ms. Joan E. Harrison the assistant project director. Other key participants at Arthur D. Little, Inc., included: Dr. Alan Burg, Ms. Paula Didriksen, Dr. John Funkhouser, Mr. Donald Gibbons, Mr. Robert Ludwig, Dr. Hadi Madjid, Ms. Jane Metzger, Ms. Joanne Perwak, Mr. Michael Michaelis, Mr. Donald Senechal, Mr. Robert Terry, and Ms. Judith Varone. Dr. William Matthews (MIT) was a consultant to the program.

The work was performed under the guidance and with the assistance of Mr. Frederick W. Talcott (project officer) and Dr. Jay Turim of the Office of Pesticide Programs, EPA; and Mr. Dan Fulmer and Mr. Phil Harter (project officers) and Dr. Jordan Lewis of the Experimental Technology Incentives Program, National Bureau of Standards.

The ADL project staff gratefully acknowledges the contribution of representatives of many U.S. pesticide companies whose cooperation and valuable comments and critique made this work possible and meaningful. Similarly, the extensive assistance and cooperation provided by the staffs of EPA, USDA, and many other federal agencies, industry and farm associations, and environmental groups was essential to the program.

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PREFACE

This volume contains appendices which provide background information and additional details to support the results of the incentives program given in Volume I. The Appendices cover four major areas as described below:

Background Information--Pesticide History and Factors of Importance in R&D	Appendices A & B
A Conceptual and Evaluatory Framework for Incentives	Appendices C & D
The Process of Initial Development and Evaluation of Incentives--a Chronological Presentation	Appendices E through M
• Listing and Initial Screening of Incentives	Appendices E & F
• Preliminary Working Papers	Appendix G
• Comments on Incentives	Appendices I & J
• Ranking of Incentives	Appendices K, L & M
• Contacts in the Program and Additional Incentives Proposed	Appendices H & N
A Projection of the Future Impact and Acceptance of Incentives	Appendix O

The reader is urged to examine Volume I and the Conference Report* prior to reading these Appendices.

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* "Developing Incentives for Pest Control Methods." Proceedings of a Conference. National Bureau of Standards, Gaithersburg, Md., October 26 and 27, 1976, Under Contract No. 68-01-3133.

APPENDIX A

HISTORY OF PESTICIDES

Attempts at pest control have been made since ancient times. Even without knowledge of insect physiology or plant chemistry, farmers utilized naturally occurring substances such as pyrethrum, which Marco Polo brought to Europe from the Far East. Sabadilla preparations have been used as louse powders by South American natives, and red squill has been used as rodenticide since before recorded history. As early as 1763, ground tobacco was used in France to control aphids.

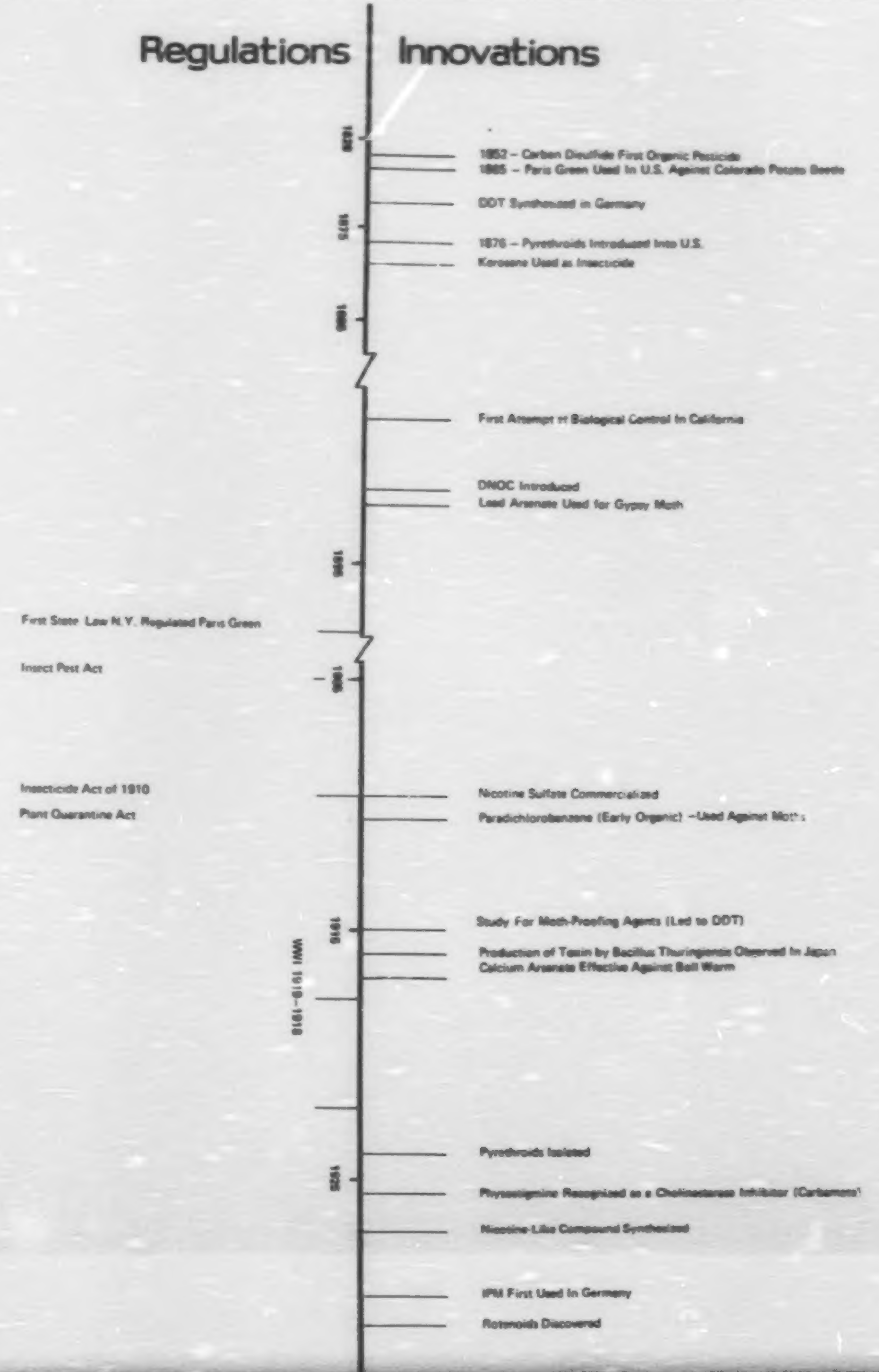
In the past 100-150 years, however, vast changes have taken place in control methods. Figure A-1 shows some of the innovations which have taken place along with some of the changes in regulations. The innovations can be grouped into three major periods each with its own innovations and use patterns: Pre-1940, WWII, Post-WWII.

1. PRE-1940

This era covers the period from about 1850 to 1939. It is characterized by very slow progress in the pesticide field, but important innovations in basic research. Great progress was made in such fields as insect and plant physiology, biochemistry, and organic chemistry. The pesticides used during this time were largely inorganic compounds, or organic compounds isolated from natural sources (pyrethrum, rotenone). During this time the public was just becoming aware of the role that insects played in agriculture and as disease carriers.

Most of the progress in pesticide development during this initial period occurred with fungicides, perhaps because the grape industry, with serious losses attributable to fungi, was one of the few organized agricultural ventures. The first fungicide, called Bordeaux Mixture (copper sulfate and hydrated lime) was used in French vineyards in 1885. About 1907, the prime sulfur solution and the self-boil prime sulfur mixture were developed for use as fungicides. These three compounds were standard from about 1907 to about 1930, and most of the research during that time concentrated on finding the proper rates and timing of applications of the three compounds.

Insecticides used during this period were primarily the arsenical compounds. Paris green, the first and most widely applied arsenical insecticide, was used in efforts to control the Colorado potato beetle in 1865 and continued to be used in the early 1900's for a wide variety of pest problems. It was replaced to some degree by calcium arsenate, which was less expensive and more effective against specific targets such as the boll worm. Sodium arsenite is still used both as an insecticide and a herbicide.


Regulations
Innovations
1850
1852 – Carbon Disulfide First Organic Pesticide
1865 – Paris Green Used In U.S. Against Colorado Potato Beetle
DDT Synthesized in Germany
1875
1876 – Pyrethroids Introduced Into U.S.
Kerosene Used as Insecticide
1880
First Attempt at Biological Control In California
DNOC Introduced
Lead Arsenate Used for Gypsy Moth
1895
First State Law N.Y. Regulated Paris Green
Insect Pest Act
1905
Insecticide Act of 1910
Plant Quarantine Act
Nicotine Sulfate Commercialized
Paradichlorobenzene (Early Organic) –Used Against Moths
1915
Study For Moth-Proofing Agents (Led to DDT)
Production of Toxin by Bacillus Thuringiensis Observed In Japan
Calcium Arsenate Effective Against Boll Worm
WWI 1914–1918
Pyrethroids Isolated
1925
Physostigmine Recognized as a Cholinesterase Inhibitor (Carbamate)
Nicotine-Like Compound Synthesized
IPM First Used In Germany
Rotenoids Discovered

A-2

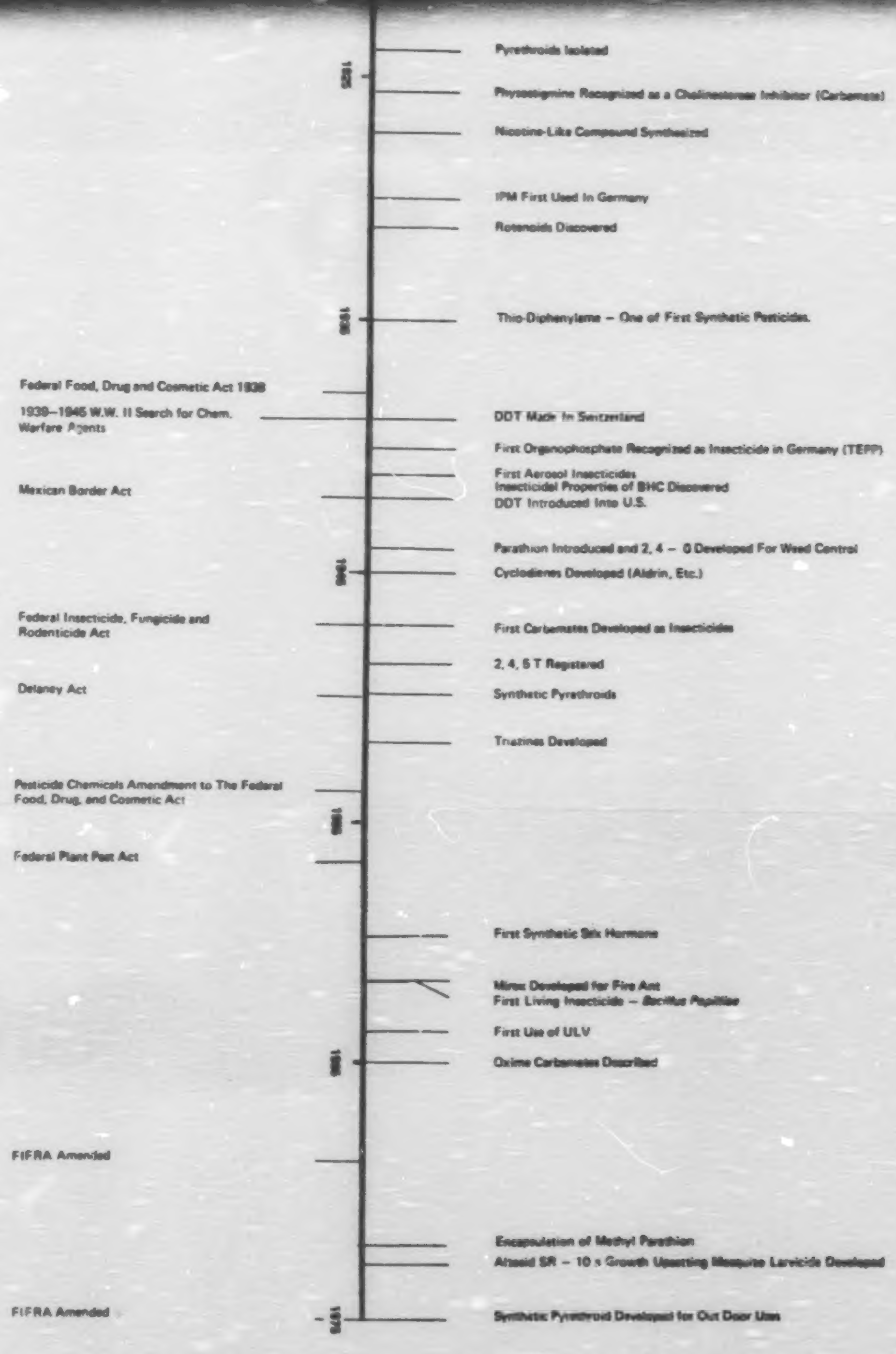


FIGURE A–1 TIME LINE ANALYSIS OF PESTICIDE REGULATIONS AND INNOVATIONS

B-2

The first petroleum product, kerosene, was used for insect control in 1877. Soon after, crude petroleum was found to be phytotoxic to most plants, so various fractions of petroleum were investigated.

The first synthetic organic compound used to kill insects was carbon disulfide, used as a fumigant in 1852. Hydrogen cyanide was introduced in 1886 as an insecticide and was the first instance in which an insect developed resistance. In 1911 the Germans used paradichlorobenzene, also one of the first synthetic insecticides, against moths.

In 1922 the USDA conducted a systematic search for new synthetic insecticides. Nicotine was proposed as the first compound to be synthesized, and in 1928 a method for forming a nicotine-like compound was discovered. The structure of pyrethrum, which had been used for centuries, was described in 1924, but the compound was not successfully synthesized until the 1950's. The structure of another naturally occurring insecticide, rotenone, was described in 1932, but was not synthesized until 1961. In this same time span, the mode of action of physostigmine, a naturally-occurring carbamate, as a cholinesterase inhibitor was recognized, although this compound was not used as an insecticide. But again, investigators were not able to synthesize the compound until later.

Biological control was used successfully in Missouri in 1870. Parasites of the plum curculio were distributed for control purposes from one part of Missouri to another. In 1873 a predatory mite from abroad was introduced for control of the grape phylloxera in Missouri. However, the success of these initial programs was not spectacular enough to cause widespread interest in biological control.

The incident that did the most to promote the development of biological controls occurred in California in 1889. Albert Koebele, from California, was sent to Australia in 1888 to search for a predator or parasite of cottony cushion scale, which was causing extensive damage to citrus trees by feeding on leaves and twigs. The first shipment of the vedalia, a predacious lady-bird beetle arrived, and within two years the scale was under control and citrus production doubled.

By 1900, interest in biological control had increased considerably, and in 1905 the Bureau of Entomology began a search for natural enemies of the brown tail moth and gypsy moth. The explorations in this case were more difficult and continued from 1905 to 1914, covering all of Europe and Japan. The explorations were renewed and completed in 1922-1927, and 13 species of parasites and predators were successfully established in New England. However, their introduction did not completely control these pests.

Other than the introduction of natural enemies, few types of biological control were used during the pre-World War II period. _Bacillus thuringiensis_ was isolated in 1915 and a few attempts were made to use this organism as a microbial pesticide; however, the results at that time were not very encouraging. Some of the biological controls were

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incorporated into early integrated pest management (IPM) techniques. In Germany in the 1930's, government management of forestry practices used several types of controls including the encouragement of natural pest predators.

Herbicides were not commonly used before 1940. The earliest herbicides included the Bordeaux mixture and other inorganic salts such as ammonium sulfate and ferrous sulfate. The first organic chemical used for weed control was DNOC in 1932. In general, research in herbicides did not start until much later, when chemical agents structurally related to the plant hormones (2,4,-D) were discovered.

2. WORLD WAR II

World War II was a major stimulus to the chemical industry, and a great many chemicals were synthesized during this period. Many of the chemicals were not originally developed as pesticides, but were recognized as such a few years later. As a result of the high interest in synthetic organic compounds from 1940-1950 and the questionable results from biological controls, interest in this latter type of control declined.

The most important advance surrounding the World War II period was the screening of synthetic organic chemicals as insecticides. The most notable development during this period was the use of DDT as an insecticide. Although this compound was first described in 1874, its insecticidal value was not recognized until 1939. In that year, potato crops in Switzerland were threatened by the Colorado beetle. Giegy provided Swiss entomologists with a sample of DDT for testing, and its effectiveness was confirmed. It was soon recognized that DDT could be used against other pests, and its popularity grew rapidly. DDT was introduced into the United States in 1942 under the trade name of Gerisol, and by 1943 was being manufactured in the United States. During the war it was used only by the military, but afterwards became available for civilian use.

The success of DDT led to the testing of many analogs for insecticidal value, such as TDE, methoxychlor, and the bromine and chlorine analogs. DDT was followed in rapid succession by BHC, toxaphene, heptachlor, aldrin, and dieldrin by 1950. The discovery of toxaphene was significant in that it was one of the first pesticides developed by directed research. (A chemist at Hercules Powder Co. hypthesized that insect toxicants would be found in the highly chlorinated terpene products. Compounds of this type were synthesized, and toxaphene was found in 1949.)

During the 1940's, the chlorinated hydrocarbons were tested and found to be effective on many pests. The high persistence of these compounds was considered beneficial, and the environmental implications were not yet realized. These compounds were so successful that other types of chemicals which were also developed during this period, such as the organophosphates and the carbamates, were not utilized.

The organophosphates were developed in Germany with the expectation of using them for warfare, although some were immediately recognized as useful insecticides. In 1938, tetraethyl pyrophosphate (TEPP) was described as a potent insecticide by Schrader (I.G. Farbenindustrie), and in 1939 as a cholinesterase inhibitor. By the end of the war, Schrader had prepared about 2,000 organophosphorus compounds, such as malathion, parathion, schradan, etc. Some of these chemicals were found to be effective against pests that were not controlled by earlier compounds. The organophosphates were marketed on a small scale after the war even though special precautions had to be taken because of their acute toxicity. These organophosphates, however, did not reduce significantly the overall dependence on DDT for insect control during this period.

Carbamates were also developed in the World War II era. The first were fluoro compounds prepared by Schrader as contact insecticides in 1936-1944. In 1947-1952, Gysin developed n, n-dimethylcarbamates such as isolan, dimetan, pyrolan, dimetilan and pyramat. About 10 years later, Sevin, one of the most commonly used carbamates, was described.

The scarcity and high cost of insecticides such as pyrethrum in 1938 led to the development of synergists for this compounds. Sesame oil was recognized as a synergist, because of the presence of sesamin. The knowledge of this structure led to the synthesis of related compounds such as piperonyl cyclonene and piperonyl butoxide. By 1948, pyrethrin type esters (allethrins) were synthesized and available in large quanities. The synergists are still used to make the synthetic pyrethrins economical.

An important innovation in application methods occurred in 1941 with the development of aerosols. This type of carrier was effective and easy to use. The need for mosquito control in the war zone was so great that aerosol bombs were used the year after they were discovered. After the war, they became available for civilian use, and the popularity of the aerosol containers grew to a $33 million business in 1949.

Another war-related development for mosquito control was the repellents. From 1901 to 1938, oil of citronella was the most widely used insect repellent. During the war, however, when the need for repellents under combat conditions was recognized, the Army tested about 7,000 organic chemicals for insect repellency. Compounds that were developed from this screening included Indalone, dimethyl phthalate, and Rutgers 612.

The use of herbicides grew rapidly immediately after WW II. The first chemical widely used for weed control was 2,4-D, developed in 1944. Within 5 years, 2,4-D was used on more than 22 million acres of small grains and corn in the United States. Another important herbicide, 2,4,5-T was registered for use in 1948, but this compound was not used widely until the late 50's and early 60's.

The development of fungicides was slow between 1940 and 1950. Bordeaux mixture and the sulfur compounds were replaced to a small extent by newer, more effective materials, such as the copper compounds and the dithiocarbamate and quinone fungicides.

Few innovations in biological control occurred during the war period, in part because of a decline in the USDA funding of biological control investigations. The change in USDA policy was a result of the uncertainty of biological control effectiveness, and the surge in the use of synthetic organic insecticides.

In 1947 Vanderplank discovered that insect control could be achieved by irradiation sterilization. However, this method was not used in the field until almost ten years later. Chemosterilants were also recognized as potentially effective in 1948.

3. THE POST-WAR PERIOD

After the war years, fewer innovations are evident although the number of new compounds has increased steadily. The massive screening programs of the 1940's had identified many broad spectrum compounds that could be used effectively against most recognized problems (except those requiring fungicides). Many of the compounds discovered in the forties were not widely used until the late 1950's and early 1960's because of this market saturation. After this, the use patterns shifted toward less persistent chemicals and, recently, more emphasis has again been placed on biological control and integrated pest management.

The 1950's was a time of rapid expansion in the use of the organochlorines. By the 1960's, however, public concern about the persistence of organochlorine pesticides was growing. At the same time, insect resistance to insecticides was becoming a problem. From 1908 to 1945, only 13 species of insects or ticks developed resistance. In 1964, about 137 species had developed resistance. These two factors, persistence and insect resistance, helped the growth of organophosphates as substitutes for the organochlorine insecticides in the 1960's.

In the mid-1960's, 65% of the insecticides used were still chlorinated hydrocarbons and 22% of the total were organophosphates. In 1970, many registrations for DDT were canceled, and by 1972 virtually all DDT uses were banned. On the other hand, the production of methyl parathion increased 24% per year between 1964 and 1969. Other relatively new products such as Furadan and Bux Ten, have been replacing chlorinated products. In 1972, chlorinated hydrocarbons, such as DDT, toxaphene, chlordane, aldrin, and methoxychlor still dominated the domestic market. Recent cancellations of aldrin, dieldrin, heptachlor, and chlordane will affect the dominance of these chlorinated hydrocarbons.

A recent compound (1975) which shows encouraging results is NRDC-143, developed by Britain's National Development Corporation. This compound is a pyrethroid and appears to be 100 times as effective as DDT, but nontoxic to mammals and birds. Previous synthetic pyrethroids have had stability problems, and they have been confined to indoor use. NRDC-143, however, persists long enough to achieve effective killing, but not long enough to accumulate.

The use of herbicides, especially 2,4,5,-T and 2,4-D, has continued to increase in recent years, and in 1962-1965, herbicides comprised 20% of the total organic pesticide production in the United States. Military use of 2,4,5-T as a defoliant in Vietnam rose sharply after 1962, and was used even more extensively after 1967. Birth defects in Vietnam were attributed to defoliants, and more studies were conducted on these chemicals. Attempts were made to restrict the use of 2,4,5-T in the U.S. and abroad in 1969.

In the early 1950's, the discovery of 2,4,5-T led to large screening programs. These screening programs, along with attempts to inhibit photosynthesis, resulted in the development of triazines.

By 1968, the triazines had become more important (in sales) than the phenoxy compounds (2,4-D and MCP) and were widely used on corn. Trifluralin, a pre-emergent compound, became important in cotton and soybean treatment. The use of benzoic acids (Amiben and Dicamba) has also increased. In 1975, herbicides accounted for 62% of manufacturers' pesticide sales, insecticides accounted for 32% and fungicides for 6% (synthetic organic pesticides).

The use of fungicides has changed little in recent years. The most important compounds, as of 1972, were PCP, the dithiocarbamates, TCP, Captan, PCNB, and Cyprex.

Interest in biological control has been renewed since World War II. One of the most well-known tests of biological control took place in the 1950's. The object of the campaign was the screwworm in the southern United States. From 1935 to 1937, the USDA tested various chemicals on this pest, but none was effective. In 1946, Knipling, a scientist at USDA, suggested that male sterilants might be utilized. Organic compounds were screened, but none were as successful as ionizing radiation in producing male sterility. Tests were begun with x-ray and gamma radiation and both were found to be effective. Extensive field tests were conducted and the technique was found to be successful in controlling the screwworm.

This success led to the development of other types of sterilants, such as chemosterilants. Goldsmith and co-workers, 1948-1955, found that certain chemicals caused retardation and abnormal development in insects that resulted in sterilization of the female. Since 1959, numerous compounds have been screened as potential chemosterilants. The most widely used compounds include apholate, tepa, and metepa.

The development of microbial pesticides has continued steadily since the mid-1950's, when the function of the toxin in Bacillus thuringiensis was discovered. This discovery, and advances in the fermentation industry, made mass production possible, and in 1958, the first commercial preparation became available. Several preparations have been commercialized since then. Insect viruses such as polyhedrosis viruses are being tested and one has been registered, but such areas as stability, application, and consistency of results have been problems.

Hormonal control of insects has also developed in recent years. Two discoveries made this technique possible. First, Wigglesworth identified the gland responsible for differentiation of hormones. Second, Carroll Williams of Harvard isolated a juvenile hormone from the adult male cecropia silkworm. Work on the juvenile moulting hormone, ecdysone, at the University of Wisconsin in 1962, isolated and identified the structure of this compound.

Zoecon Corporation, in California, is investigating hormonal control of insects. Its product, Altosid SR-10, a growth upsetting mosquito larvicide, has been successful in the field, and has just recently been registered.

Anti-juvenile hormones, capable of controlling insects in the larval stage have recently been discovered in plant extracts. These anti-secretion compounds show great promise for a variety of pests.

Since 1950 attractants have also been tested as an insect control method. In Florida during 1956-1957, a hydrolysate-bait was applied with malathion for control of the mediterranean fruit fly. The amount of malathion required was only one-fourth that needed without the attractant. The test was highly successful, and other combinations were developed. The natural sex attractant was isolated from the female gypsy moth around 1960 in Germany. A similar sex lure called gyplure has been synthesized and has been produced in quantity in the United States. Other sex attractants have been isolated since that time, but they are used mainly as bait and survey material. Around 1967 and 1968, many more pheromones were isolated through the use of improved microanalytic techniques, and their function is now perceived as one of controlling insect problems rather than surveying. Recently an experimental permit was acquired for the use of pheromones as a control technique.

The two major innovations in application methods which have occurred in the last 25 years were the development of aerogels and ULV. In 1959, the silica aerogels were found to be effective against termites. (The dust vehicle itself was found to be effective, and the mode of action was dessication.) The development of ULV in 1964 reduced the costs associated with transporting, mixing, and applying the carrier. The efficiency of the insecticide is sometimes increased in this type of application. To date, however, few compounds have been registered for ULV use.

Encapsulation and other slow release techniques have been tested in the last 10 years. Pennwalt Corporation developed a technique of encapsulating methyl parathion which makes it less toxic to handle, and more persistent in the field. Pennwalt is also testing an encapsulated synthetic sex attractant against the gypsy moth in cooperation with USDA. Other pesticide companies are also investigating the possibilities of encapsulation, plastic laminates and polymeric capillary tubes for the slow release of pheromones.

The importance of integrated pest management has increased considerably in recent years. IPM has had a sporadic history, with impetus coming mainly from lack of alternatives, i.e., after single control methods have been tried and have failed.

An early example of a conscious attempt at integrated control took place in California from 1955 to 1960. The spotted alfalfa aphid was first detected in California in 1954. Within two years, it spread widely over the state and was devastating the alfalfa industry. Natural predators were unsuccessful in controlling the aphid. Broad spectrum organophosphates were then used, but these insecticides killed many of the natural predators and parasites. However, the aphids were fairly well controlled until resistance developed and the control costs increased. The solution seemed to be to use natural predation with a selective chemical that would not interfere with the predatory population. Therefore, Demeton was used, along with the biological control, and the aphids population was greatly reduced within a year.

The availability of alternative methods of pest control has increased greatly, as have the number of accepted control methods. The question is, however, whether the use of these alternatives has increased with time.

As was described in the section on the history of pesticides, the years before 1940 were characterized by the use of a limited number of inorganic compounds, such as sulfur, copper, lead, and arsenic. These materials were used for fungicides, herbicides, and insecticides. The alternatives available at that time were also somewhat limited.

A few organic compounds were available before 1940, and these were used sporadically as fumigants and moth-proofing agents. The most widely used alternative method was biological control (the use of predators and parasites). Actually, interest was quite high in this type of control since the inorganic compounds were not always effective.

The success of biological control was dampened with the advent of DDT in the 1940's and 50's. At the same time, the organophosphates and the carbamates were available. However, DDT supplanted almost all other methods of control and few alternatives were utilized during this period.

With the unexpected development of resistance to DDT, and the complaints of DDT's persistence in the environment, some of the other chemicals were brought into use in the 1960's and 1970's. Today, the selection of accepted chemicals is wide, as is the range of alternatives. Accepted means of control today include the chlorinated hydrocarbons, organophosphates. carbamates, and the phenoxy and triazine herbicide. The chlorinated hyrocarbons and the phenoxy compounds are losing favor, however, they are still widely used.

Many options besides the chemicals described above are available today. Interest in the introduction of parasites and predators has been revitalized, and bacteria and viruses are also used to control insects. Sex attractants, juvenile hormones, and male sterilants may be utilized.

The extent of use of these alternatives is not particularly high at the present, except perhaps for the use of predators and parasites. Acceptance of these new methods is slow, but increasing. They are used in most cases when traditional methods of control fail or are not available.

One type of pest control which could be considered an alternative is integrated pest management. This control method became more widely used in the 1960's and 1970's almost out of necessity. A complete management program is used when a single minded control attempt is not as successful as it might be. Integrated control attempts to combat pests using resistant crop strains, natural predators and parasites, and additional chemical or non-traditional methods when necessary. The role of this alternative should become increasingly important in the future, since it has been successful in many cases.

4. SUMMARY

In general, pest control development has advanced steadily since its slow start--early in the century and the burst of activity around WW II. A current limit to innovative advancement is the lack of coordination between the basic research being conducted and efforts to develop and commercialize products. If these and other barriers discussed earlier were eliminated, it is likely that the late 1970's and early 1980's could be a period of major advancement.

The identification of sources or funders of innovations is particularly important to the development of incentives since they may be the most appropriate recipients of incentive. An historical perspective is useful in this consideration.

Non-traditional control methods have come from various sources, but do not usually originate from pesticide companies. A large amount of work, especially with predators and parasites, has been done by USDA. University and individual researchers are much more important in providing innovations in non-traditional control methods. The funds are provided by such sources as USDA, NSF, the Rockefeller Foundation, and grower's associations. Work on pheromones, juvenile hormones, and viruses have been funded via these channels.

In terms of actual pest control methods available to the user, however, pesticide companies are the major force in pesticide development at this time. In the past, innovations such as DDT, the organophosphates, and the carbamates were developed by European chemical companies. This source of innovation continues to be important today, with the contribution of American companies becoming important. Systemic insecticides and the triazine herbicides are examples of recent innovations coming from chemical companies. Although incentives may apply elsewhere, with some results, they will be most useful if they indirectly or directly influence industry.

APPENDIX B

FACTORS OF IMPORTANCE IN PESTICIDE DEVELOPMENT

Investigations into pesticide development in the past showed that a historical perspective is not necessary to develop incentives for pesticide development. As described in Volume I, we felt that the best way to determine where incentives would be most effective was to interview various pesticide companies and determine what factors affected pesticide development.

The following section details the results of our discussions with industry. It describes the factors which affect or are considered in pesticide development. Various factors or problem areas which may be improved by incentives have been highlighted. The identification of these problem areas led directly to the development of the 64 incentives described in Appendix E.

1. FACTORS AFFECTING PRODUCT DISCOVERY

a. Serendipity

Serendipity--the gift of finding the unsought-for valuable--is an undefinable commodity which sometimes operates in the development of pest control methods, but is especially important in the early stages. (In one case, for example, a drug company was testing compounds using mice and rats as laboratory animals. High rat mortality was reported for one of the compounds, and the compound eventually was developed as a rodenticide.) Serendipity is usually not pure chance, but requires a well-qualified observer to capitalize on the circumstances. Because serendipity is unpredictable and uncontrollable, it is not very susceptible to influence by incentives.

b. Synthesis Operations

Companies vary widely in their synthesis and screening operations. Many pesticide companies synthesize and screen large numbers of chemicals by a variety of techniques. Some companies do no synthesis, and prefer to license compounds from other companies or sell non-proprietary compounds. Others synthesize all types of compounds, often for purposes other than pesticide use, but screen everything for pesticidal activity.

Many international companies do all synthesis work in Europe, with the American counterparts continuing the development. A few, however, do both in the United States. The types and innovativeness of the compounds synthesized depend on the company, and the scientists involved, and do not seem to be generalizable. Screening operations usually include only the major crops and pests. One company told us it screened potential pesticides for effectiveness on corn, soybeans, wheat, rice, potatoes, sorghum, and sugarbeets only.

The screening also varies greatly from company to company--size, thoroughness, time of observation, etc.

Although synthesis and screening operations are not major roadblocks in the development of pest control methods, incentives can be applied usefully at this stage of development when:

(1) The typical synthesis and screening operation excludes the possibility of developing innovative products.

(2) Profitability considerations preclude a screening operation, a common occurrence for minor crops.

2. FACTORS AFFECTING PRODUCT DEVELOPMENT

a. Return on Investment and Profitability

Gaining adequate return on their investments was the major concern of all the companies we talked to; however, investments and returns vary widely from company to company. First, investments in a product depend on the type of product and the type of company. At one extreme, a large basic producer would have to invest money into research, testing, fulfilling registration requirements, production facilities, insurance, and advertising and sales. At the other end is the small company that does not do its own research and thus has to invest only in a license for a product, production facilities, and marketing.

Company policies also bear directly on the question of profitability. For example, some companies will consider only those products which have the potential to grow at some minimum rate. One company we talked to expected a 12% annual growth rate. Moreover, some companies are interested only in the short-term profitability of a product. These companies usually obtain their products by licensing from other companies, and avoid spending time and money on research. Conversely, some companies conduct a great deal of research and invest a great deal in a product and therefore are interested in long-term profitability. Finally, some companies try to achieve profitability with one big winner rather than with several smaller products. Thus, while most of the companies we talked to were concentrating their efforts on one product, one company preferred to look for three $35-million products, for greater stability. These decisions are very company-specific and cannot be correlated with company type.

Another variable is the amount of risk a company considers acceptable. In the consideration of a compound, the risks or unknowns include such things as registration time and cost, the market size, and the possibility of lawsuits. The risks are evaluated in different ways, with different thresholds. Some companies have sophisticated models in which they incorporate the estimated risks. The outcome is a prediction of profit which is then rated as acceptable or unacceptable. Other companies have less elaborate means of coming out with a similar type of prediction. The thresholds of risk are company specific, and not always consistent.

They also are not generalizable as to type of company.

In summary, the relationship of this factor to incentives is vague because company policy largely determines the required R.O.I. and profitability. There are other factors discussed below which are tied to this factor, where problem areas are more easily identified.

b. Size of Market

The size of the potential market is an essential consideration in the evaluation of a product. Just about every company has some idea of its minimum acceptable market size. This threshold ranges from $100,000 to $1 million to $10 million, depending on the type and size of the company. A smaller licensing company with no particular marketing scheme, and looking for short-term profitability, might consider a market as small as $100,000. The smaller basic producers, or the larger licensers or formulators might search out markets of $1 million or more. The companies looking for the big markets ($10 million or more) are the larger companies.

In specific cases the actual minimum will be determined in large measure by the profit potential. As described previously, a high investment is required to develop a pesticide, and the market volume must be sufficient to provide a return on the investment. Most minor crops cannot provide this market volume, so a compound rarely is developed especially for minor crops. Companies who have done this say they would not attempt it again.

Many minor crops are covered through extension of the registration of a product developed for a larger market. Many companies, however, feel this procedure is not economically feasible, since the cost of extending a registration is usually around $25,000, and sometimes as high as $100,000 for a food crop. In many cases, this investment is considered too large. Moreover, many compounds will not be reregistered for minor uses because of the cost of the additional testing required.

Another important consideration in the determination of a threshold market is liability. Many low-volume crops have a high cash value, and one suit could wipe out a whole year's sales. Companies reported to us cases where growers requested a product and then sued the company when the product proved ineffective or phytotoxic. In several instances, products have been taken off the market because of suits. The home and garden area is particularly sensitive, since liability centers around human hazard. Several companies we talked to had gotten out of, or were hesitant to go into the home and garden market, even though they felt it was profitable. Companies also want to avoid suits because they give a product a bad name and indirectly could have a significant economic impact. For example, a small suit involving a minor crop could have large effects on the sale of a product to a larger market. Most companies feel that the liability risks are too high in a minor crop.

The IR-4 project, which has had some effect on companies' consideration of minor crops, is in effect, an incentive already in operation. This project is part of the CSRS, and was set up in 1963 to compile required information for obtaining pesticide tolerances and registered labels on minor use crops. Initially, this organization gets recommendation from state extension services and makes a list of priority problems. IR-4 then goes to the company involved and assesses the chances for registration, and obtains the company's agreement to register it. The residue work is done by the state experimental stations. This data, together with that from the company, is combined and sent in as a regular application. The only difference is that the $10,000 application fee is waived for IR-4.

The effect of this program on companies is to decrease their investment costs greatly and thus make smaller markets more attractive. However, liability problems remain to be considered. In fact, they may be more serious in the eyes of the company, since the data has been submitted by another party, whose work is often unknown to them. For this reason, many companies are still hesitant to register their products on minor crops. In addition, the general opinion is that IR-4 needs to be expanded or reorganized. Many companies feel that the project is bogged down with formulations, and is not as effective as it might be.

The foregoing analysis of market size suggests several roadblocks which may be amenable to incentives:

1. The high investment required for the low return of minor crops is often a blockade.

2. Liability is a barrier to the protection of high-value, low-volume crops and to the home and garden market.

3. Company policy dictated by the need for a big winner neglects the smaller markets.

4. The work of IR-4 is hampered by the unwillingness of many companies to register products cooperatively, and by the large volume of registrations requested each year.

c. Proprietary Position

A proprietary position on a product is considered essential by most companies, and patents are the prime means of obtaining this position. In rare cases, a company may have such a processing or marketing advantage that it feels its position is safe, even without a patent.

The lack of patentability of non-traditional control methods has presented a problem to many pesticide companies. Naturally-occurring materials such as *Bacillus thuringiensis* are not patentable, and several companies suggested that they would not go into biological controls without a patent. One company that has gone ahead with this type of product felt that its advantage was in marketing.

Other products, such as synthetic hormones or growth regulators, are patentable, and several companies reported that they were doing research in these areas.

Any products developed with government financing are also not patentable. In some cases, potential products developed by USDA were not exploited by industry for this reason. For example, USDA developed a repellent recently and offered it to several companies. However, no company was willing to produce it without a patent. In another case, a pheromone was developed by the government and picked up by a small company which had the necessary chemistry to produce it. However, products transferred from government to industry are the exception, not the rule.

Government funds are also often provided to universities for research on pest control methods. This makes any products they may come up with non-patentable, and the transition from university to industry also becomes very difficult.

The expiration of patents is of concern to some companies, especially those that are in very competitive markets. However, all were concerned about the loss of patent time due to registration requirements. Many companies feel they lose the full benefit of their patent, and do not have enough time to make a return on their investment. One product, which is in the tenth year of its patent, has had only two successful sales years.

In summary, problems related to patents which may be amenable to the development of incentives include:

(1) Protection of naturally occurring materials (considered essential by many companies).

(2) Transferral of ideas or products developed by the government or universities (very difficult now because of patent problems).

(3) The loss of patent time because of registration requirements for all types of products, but especially innovative ones (a problem for all pesticide developers).

d. Health and Environmental Considerations

At one time, pesticide producers and consumers primarily considered only the efficacy of a compound in their evaluation. However, these attitudes have changed somewhat in the last ten years, mostly as a result of the environmental movement. Rachel Carson, in 1962, caused the public, and especially government officials, to become more aware of the dangers of pesticides. Residues of DDT began appearing in untreated areas, and concentrating in organisms high in the food chain. At the same time, regulations and registration policies became stricter, and environmental considerations became very important in the registration of a compound.

As a result, pesticide companies have begun to consider this factor early in the screening of pest products, although opinions differ among companies about the essentiality of health and environmental parameters in determining whether to go ahead with a product. Two such parameters, toxicity and persistence, have been the basis for stopping the development of some compounds. Other environmental factors such as bioaccumulation or mobility usually have not prevented a company from going ahead with a product. Some companies have an absolute limit on an LD_{50} of a compounds which they will consider.

A few companies strive to provide safer products than their competitors. This type of company feels the public is concerned, and hopes to answer their demands for safer products. One problem with this strategy is that the consumer cannot distinguish safe products from more toxic ones, since no such statement can be made on the label.

Although the inherent characteristics of compounds or control methods cannot be affected by incentives, they might be modified by changes in formulation or application techniques. The consideration of health and environmental aspects by pesticide companies and users is desirable to EPA; therefore incentives should be directed at encouraging it.

APPENDIX C

CONCEPT AND FRAMEWORK FOR INCENTIVES

1. THE INCENTIVE CONCEPT

The term "incentive" is familiar. It derives from two Latin words: incentivus, meaning something that sets the tune, that provokes or incites; and incinere, meaning to sing or sound. An incentive is thus something inciting to action or effort, such as fear of punishment or expectation of reward. A related term is "incantation," meaning a formula of words intended to produce a magical effect; from "incantation" come "charm" and "chant."

"Incentive" is so familiar that it can be used and understood in various and confusing ways. Common usage tends to emphasize the charm of money, for example incentive pay, as a method of inciting assembly line workers to expend greater effort improving their productivity; managers have sometimes employed chants and company songs to help motivate salesmen to achieve higher targets and profits. Similarly, familiar forms of federal governmental incentives are money grants, for example to states to encourage building of roads, and chants, for example slogans exhorting citizens to buy savings bonds.

The familiarity of these types of incentive tend, however, to obscure two significant points. First, effective incentives can exist in many different forms. Second, the interests of the incentive provider are no more important than those of the incentive receiver; too often, in fact, incentives seem to have been designed with much more attention given to what is desired by the provider than what is desired by the receiver/responder, which can lead to building too many highways and to relying too long on overworked and empty slogans.

Thus, even though an incentive may be thought of as something which is given to incite a certain action, it is more useful to think of it as something which links two sides of an equation or two partners in a deal. The incentive provider seeks to attract (or compel) an actor (an individual or an organization) to change his behavior in specific ways related to the provider's general goal and specific objectives. In order to obtain the desired actions, the incentive must somehow appeal to the responder's desires or fears, and thus to his goals and objectives. But the goal structures of the provider and the responder are certainly not alike. Indeed, EPA's overall goal of protecting the environment may conflict directly with the industry's general goal of maximizing profits by marketing pesticides. However, each partner to the deal has several purposes or needs (often competing), which each organizes (perhaps intuitively) into some order or hierarchy. For example, EPA cannot afford to protect the environment at the obvious expense of lost agricultural production and scarcer or less nutritious food. Likewise, the industry would also suffer from losses and weaker demand from agriculture. So, despite differences between their general goals, the two partners share some similar specific objectives. An incentive thus succeeds insofar as it links objectives shared by its provider and its target actor. A successful incentive is thus a type of bargain or deal in which each party feels it gains more than it pays or gives up.

This concept results in several implications. In order to design an effective incentive, the provider clearly must know several things, either empirically or intuitively, including:

- The provider's own general goals and specific objectives, for example EPA's intention to encourage pest control methods which are increasingly non-toxic to non-target organisms;
- The actors (incentive responder) to be motivated (ranked by importance), for example pesticide manufacturers, formulators, dealers, and applicators;
- The responders' goals, objectives, and probable patterns of behavior in reaction to various types of incentives; even though the specific objectives of the several groups which comprise the pesticide industry vary greatly, they share the common goal of maintaining or improving their business operations; and
- Problems or barriers hindering responders from acting in ways desired by the provider, for example, fragmentation of the market for certain (minor use) pesticides.

2. THE CONCEPTUAL FRAMEWORK

The task of determining effective incentives for innovation in pest control methods is complex, however, and a conceptual framework for achieving this end was developed. This framework consists of four basic parts--criteria, factors, incentives, and innovations.

Criteria are the major determinants of success, where success is defined as the safe and effective use of a pest control method or product. Prior to the 1960's, the major criteria affecting success were effectiveness, commercial potential, feasibility of production, and consumer attractiveness. A fifth major criterion has been added: safety. This criterion is important both to the consumer and the producer.

All of these criteria must be met in order for a pest control product to be a success; that is, it must be effective, it must be commercially attractive, it must be safe, it must be produced economically, and it must be used.

Many factors or conditions make up a criterion. For example, in the assessment of commercial attractiveness, factors such as patentability, market size, competitive products, and the nature of the use should be considered. If these conditions or factors are not met satisfactorily (to the developer) then the criterion is not met and the product is not a "success." In this case, an "innovation" is needed to either change the conditions or how they are met. If this innovation is not forthcoming, an incentive may be needed.

Incentives can be described and categorized in various ways for various purposes. The following four descriptions are general:

• Direct	Directly associated with industrial R&D on new pest control methods (for example, EPA grant to company X to develop a new biological control agent for forest products)
• Indirect	Affects industry/others so that indirectly more emphasis, funds, activities will be devoted to new pest control R&D (for example, patent extension of 3 years which may lessen risks of some potential products enhancing industry investment)
• Positive	The traditional incentive which rewards actions or provides additional methods, approaches, funds to accomplish a task or project (example, direct funding of R&D to universities on application methods)
• Negative (restrictive)	An incentive (disincentive) which removes or restricts a currently used action, approach, etc., to force a new mode of action (example, denial of registration of potential insecticide products on specific crops except growth regulators, parasites, predators, virus and bacteria)

As an example of this process, a product may be too costly to produce, (factor) in which case the feasibility of production criterion is not met. In this case a change may be needed in the technology, or in the cost to the producer. An incentive may be needed to either make these production costs acceptable by subsidy or tax benefits, or to reduce the costs by technical innovations.

A conceptual outline of the process might include the following:

"Criteria" combine to define "success."

"Factors" or "conditions" combine to define "criteria."

"Innovations" can influence how "factors" or "conditions" are met.

"Incentives" can influence whether "innovations" occur.

Table C-1 shows some of the various factors which make up the five criteria. Table C-2 shows seven categories of incentives, defined by the way in which they operate.

a. The Time Dimension

The order of meeting the various "conditions" and "factors" is of utmost importance in assessing the relative importance of various innovations and thus the emphasis that should be placed on any given incentive.

Consequently we analyzed the various action and decision steps in the development and utilization of pest control methods on the basis of the circumstances surrounding periods of high innovative activity and the effect of potentially important factors. Our objective was to identify the major decision steps and the action steps (or "factors" and "conditions") that precede each step, and then to divide these "factors" among the appropriate "criteria" on a time/decision framework.

b. Identification and Evaluation of Incentives

On the basis of the foregoing rationale, we established the following procedure for the identification and initial evaluation of incentive actions:

1. Develop a list of factors of importance in research, development and marketing of new products.
2. Determine which factors are essential, which are helpful, and which are insignificant to:
   - various type companies
   - various persons within companies
   - other interested parties

   (Matrix 1)
3. Determine the actors who will make overriding decisions on these factors. (Matrix 1)
4. Determine the components which contribute and are critical to meeting these factors. (Matrix 2)
5. Among these components, establish which are most frequently not met in practice (these should be most appropriate for incentives).
6. Determine the types and nature of the barriers which prevent these components from being met adequately.
7. Determine the facilitating actions (incentives) which can be applied to eliminate these barriers.

TABLE C-1

Factors and Criteria of Pesticide Development

"Efficacy"	Commercial Attractiveness	Safety Considerations	Production Feasibility	Consumer Attractiveness
Initial Devel.	market survey (prediction of factors listed under consumer attractiveness	tests to determine safety and to comply with federal, state and local regulations	production technology	advertising
understanding of pest physiology	patentability	persistency	capital requirement	cost of product
cost of research	patent time	toxicity and other non-target effects	construction costs and delays	distributor's influence
ability to synthesize	competitive products	mobility	production capability	State Exp. Sta. evaluations
adequate analytical techniques	major vs. minor use	selectivity	process and operating costs	market conditions
ability to kill target	user (gov. vs. citizen)	metabolism	distribution channels	acceptability
Compound Effectiveness	size of market	bio-accumulation	effectiveness of sales persons	nuisance factors
overall effect on crop	- no. users	residues in food	availability of formulation facilities	perception of safety
effectiveness in field	- volume	factors affecting decisions to get experimental use permit and registration	plant siting considerations	application of product
consistency of results	duration of utilization	early specificity of requirements	packaging	- cost complexity
residual effectiveness	nature of use (epidemic, military, food, etc.)	testing procedures	storage and product lifetime	- frequency
formulation and application technique	profitability	cost of tests	pollution control needs	- ease
margin of safety	broad spectrum vs. narrow spectrum	total time of tests		- requirement of certified applicator
consideration of unforeseen consequences	suitability for foreign markets	regulatory delays		immediacy of results
carry over effects		prognosis for registration		effect on crop
broad spectrum vs. narrow spectrum		timing of permit approval		- marketability
consideration of compound combinations		possibility of unforeseen consequences (econ., admin., and legal)		- yield
weather and meteorological considerations		post-use monitoring		carry-over effect
				effectiveness of sales persons

TABLE C-2

Types of Incentives (Operational)

- Administrative/Regulatory by EPA: Incentives which change an administrative procedure, regulatory requirement, document, or guideline, so as to responders to act in certain ways; for example, amending FIFRA to eliminate its present 3(c)(1)(D) clause.

- Administrative/Regulatory by Other Agencies: For example, amending the patent law so as to compensate patent holders for forced shortening of patent life resulting from time absorbed by government's registration process.

- Funds: Direct funding, or credit, to subsidize and encourage specific parts of the pesticide development process; familiar examples from other programs include federal 90% funds offered to states to provide the remaining 10% and to build interstate highways and loan guarantees for low-cost housing.

- Service/Function/Facility: Resources in kind offered for direct use in the pesticide development progress; parallel examples include leasing of federal land for oil shale exploitation, designing an intercontinental bomber which is given to airframe manufacturers to adapt to civilian aviation, and the TVA's development of an improved fertilizer which is then given over to commercial marketing.

- Manpower/Training: Providing personnel resources; prominent examples include agricultural extension services to stimulate modern agricultural practices, and training unemployable workers to qualify for entry-level jobs.

- Information/Data: Providing, organizing, or evaluating information needed by responders; familiar examples include government-funded clearinghouses, the National Technical Information Service (NTIS), and standard-setting services by the National Bureau of Standards (which may also be related to regulatory actions).

- Consumer/Market: Indirect incentives which seek to create or enlarge markets, and thus to motivate changes by industry; for example, aggregating purchases by government agencies to create attractive markets and setting specifications which will also improve products sold to non-government buyers.

MATRIX 1

To Use in Ranking Importance of Factors to Parties at Interest

ACTORS FACTORS	EPA	Large Co. President											
low persistence	N		H	H		N*							
return on investment		H*	N										
					N*								

N = Necessary
H = Helpful
N* = Necessary and overrides other factors
H* = Helpful and overrides

MATRIX 2

For each factor, list component and determine critical component for each actor.

ACTORS / COMPONENTS	Small Co. President		Large Co. Res. Dir.		EPA	USDA							

8. Determine the agents/persons who must apply the incentives, respond to the incentives, or be intermediaries in the process and their willingness to make this contribution (Matrix 3).

9. Trace back through the above steps to determine the potential effects of these incentives.

However, by the time we had proceeded through the first several steps, it became apparent that this procedure, while theoretically ideal, was not sufficiently practical to be used throughout the program. Furthermore, the program goals and objectives changed somewhat to focus on incentives to reduce the problems resulting from regulation and to encourage safety and biologically integrated pest control. Consequently, we adopted a more empirical approach to the identification and evaluation of incentives. In retrospect, many of the steps indicated in the theoretical approach were conducted, but in a less formal and detailed manner.

MATRIX 3

Use in Assessing Feasibility of Incentive

ACTORS FACTOR COMPONENT INCENTIVES	EPA	Large Co. R&D Mgr.	Small Co. President	IR4 Program		USDA							
1) Factor													
a) Component 1													
i) Incentive 1	✓ DI		NI										
ii) Incentive 2		✓✓ DI	NI			✓ DI							
b) Component 2													
i) Incentive 1	✓ DI	NI	✓✓ DI	* DI									
ii) Incentive 2													
2) Factor													

DI = Desires Incentive
NI = Not desirous of incentive
✓ = Actor applies incentive
✓✓ = Actor who responds to incentive
* = Intermediary

APPENDIX D

PRELIMINARY CRITERIA FOR SCREENING OF POTENTIAL INCENTIVES

CATEGORY A - SIGNIFICANCE AND APPLICABILITY

1. Is the incentive significant/applicable to the important goals of the incentive program as defined by EPA?

   a. Improve environmental and human safety of pest control agents and use practices--

   - promote pest control methods that are increasingly

     - non-toxic to non-target organisms
     - non-mobile and non-bioaccumulative
     - narrow spectrum
     - non-persistent

   - promote biological control, integrated pest management and other non-traditional chemical pest control approaches

   b. Maintain or develop an adequate supply and variety of pest control methods for all important pest problems

   - increase variety and availability of pest control methods by stimulating innovation

   - encourage development of pest control methods for minor crops and markets

   - maintain viability of the pest control industry and enhance R&D resources

   - maintain diverse resources for pesticide research and development

   c. Increase the effectiveness of pest control methods--

   - encourage R&D on new, effective pest control methods

   - promote innovation in formulations, application and use practices

- encourage practices and methods which minimize pest resistance and maintain natural control mechanisms

d. Decrease economic costs of pest control--

- improve cost/effectiveness of pest control methods
- maintain resources for alternate pest control approaches

2. Is the incentive significant/applicable to the factors of importance to industry in developing new products?

a. Improve profitability/return on investment

b. Enhance individual product markets through:

- increasing total potential market size
- increasing access to market
- increasing market penetration
- providing competitive edge

c. Reduce registration time and costs

d. Enhance proprietary position

e. Encourage new corporate entries

f. Improve safety--

- human toxicity
- persistence in environment

g. Allow company freedom of choice

h. Assure compatibility/congruence with product line

i. Enhance product novelty or uniqueness in marketplace

j. Reduce liability or enhance ease of insurability

k. Enhance foreign market opportunities

l. Improve screening operations

m. Improve synthesis operations

3. Is the incentive significant/applicable to the needs of agriculture and other pesticide users?

   a. Improve the "unit profitability" of agricultural production

   b. Improve the availability and effectiveness of pest control methods for minor crop and specialty applications--

      - minor food crops
      - forest products
      - vector control
      - right of way
      - stored products
      - home and garden
      - rangeland
      - waterway
      - industrial crops
      - cultural practices
      - resistant pests

   c. Enhance the security of agricultural enterprises (e.g., through the improved predictability of crop harvest)

   d. Improve the availability and cost/effectiveness of fungicides, nematocides, growth regulators, rodenticides, etc.

   e. Enhance the development of innovative functional, effective and inexpensive pest control methods

   f. Reduce other agricultural input requirements through use of effective pest control techniques

   g. Improve the cost/effectiveness of methods for storage, application and disposal of pesticides

   h. Improve the diversity of opportunities for agricultural enterprises

   i. Improve the availability and cost/effectiveness of integrated pest management approaches

   j. Improve the safety--environmental and human--of the use of pest control methods

   k. Enhance the "social acceptability" of agriculture and agricultural practices

   l. Enhance the effective lifetime of land for agricultural activities

CATEGORY B - FEASIBILITY

4. Is the incentive simple in concept and direction?

5. Is the incentive simple to implement?

   a. Existing agency or institutional structure and mechanism available

   b. Resources available for implementation and conduct of resultant efforts

   c. Political posture/factors acceptable

   d. Minimal interagency action

6. Does administration of the incentive require a low administrative burden?

7. Is the overall feasibility of implementing the incentive action promising?

8. Are the risks or uncertainties in achieving desired goal low?

9. Is the incentive compatible with current and likely future trends?

a. Environmental policy and regulations

b. Agricultural production and consumption

c. Pest control uses

d. Environmental concerns

e. Energy availability

f. Industry structure

g. Federal agency policies and actions

h. Consumer preferences

i. Social values

j. International considerations

CATEGORY C - ACCEPTABILITY/DESIRABILITY

10. Is the incentive acceptable to the various actors potentially involved?

    a. Established pest control industry--

       - manufacturer
       - formulator
       - wholesale distributor
       - dealer

    b. EPA--

       - OPP
       - Other

    c. Other federal agencies

    d. Congress

    e. Agriculture industry/farmer

    f. Other pesticide users

    g. Public

    h. "Public interest" groups/environmentalists

    i. Universities

    j. States

11. Does the incentive have real benefits to the parties listed above (other than the pest control industry, agriculture and other pesticide users)?

12. Are the costs to the parties listed sufficiently low to be practical and acceptable?

13. Is the goal to which the incentive is directed acceptable and desirable (significant) to these parties?

CATEGORY D - TIMING AND INTERACTION

14. Can one expect a short response time until results are apparent?

15. Will the incentive demonstrate a long duration of effectiveness?

16. Does the incentive require implementation for only a short time?

17. Can the incentive action sustain or pay for itself, without continued and long-term commitment of resources by the incentive provider?

18. Do many of the above criteria need to be met before the incentive can be made effective (convergence)?

19. Does the incentive encourage the emergence of a champion/advocate?

20. Is the incentive relatively independent of other incentives and their implementation?

21. Duration and continuity--degree to which incentive is available when desired.

APPENDIX E

SUMMARY LISTING OF ORIGINAL INCENTIVE ACTIONS

INSURANCE/LIABILITY

1. Insurance for Minor Crops

   In order to encourage pesticide companies to develop and register products for minor crops, the federal government create an insurance program to reduce the company's liability for production-related damage to these low total volume, often high value crops.

2. Government Insurance for Farmers Using Improved Pest Control Methods

   Through a new USDA insurance program, reimburse farmers for crop losses resulting from use of innovative pesticides, formulations, or application methods.

3. No-Fault Tolerance

   USDA and State Experiment Stations would develop "guaranteed" residue and phytotoxicity data which could be used for registration by interested industrial organizations. Companies would not be liable for any crop losses for a specified period after registration if these data were used.

4. Insurance for Unsuccessful Product Development

   To encourage the development of more pesticide products, the federal government would provide insurance to companies to reimburse development costs of new products of proven efficacy if they are found to be unacceptable during the environmental and safety test and evaluation.

5. Product Failure Insurance

   The federal government would participate in a program to provide insurance to protect companies against losses due to product failures or product-related accidents. Insurance would not be restricted to minor crops.

6. Reinsurance

   To provide better insurance coverage for pesticide companies, a federal reinsurance program for catastrophic losses would be established.

14. Reorganization of USDA Research on Biological Control

Reorganize USDA research on biological controls to include more IPM testing, product or program development, and pest-targeted efforts.

15. IPM Copyright

Provide copyright or similar protection for IPM systems in order to provide royalties to system developers.

REGISTRATION CHANGES

16. Reduced Registration Time for Safe Products

Reward companies that develop safe pest control products by providing a shorter and less expensive registration process.

17. Facilitate Registration Process for Innovative Products

Through granting of priorities for, and changes in, administrative procedures, facilitate review of experimental permit and registration applications for innovative pest control products.

18. Reduced Registration Requirements for Biological Controls

Encourage the development of biological control methods by administrative or substantive changes in the registration process that reduce the requirements for these products.

19. Decreased Uncertainties of Registration Process for Applicants

Through changes in the staff and procedures at EPA, specify specific time frames and establish stable and clear procedures for the registration process in order to stimulate registration of more products.

20. Reduced Time and Cost of the Registration Process

Streamline and/or reorganize both administrative and technical requirements of registration in order to achieve more registered products and more products registered for minor uses.

21. Registration of Only the Safest and Most Effective Product for Each Use

By extremely selective registration of only the most desirable products, encourage continual new product development incorporating ever increasing safety and effectiveness.

IR-4

7. Supplemental Funding for IR-4

Fund, through EPA, additional residue testing of chemicals and biological controls through the IR-4 program.

8. Residue Journal

As part of IR-4, establish a journal to publish residue research in order to recognize scientific work of an important but not glamorous type.

9. Crop Groupings for Minor Crops

By means of crop groupings, enable registration of one product for several minor crops on the basis of one set of tests.

10. Insurance for IR-4

Through a fund available to IR-4 from USDA, reimburse farmers for crop losses due to use of product registered through the IR-4 program during the first two years after registration.

INTEGRATED PEST MANAGEMENT AND BIOLOGICAL CONTROL

11. Government Support to Users of a USDA IPM Service

At the initiative of EPA, set up an IPM advisory service for farmers, including among the advisors the USDA Extension Service and representatives of companies whose products could be used in IPM.

12. Subsidy for IPM

Government support (by direct subsidy, tax credits, or returns) to agricultural groups or farmers in a region who use IPM techniques rather than traditional pest control methods.

13. Rights to IPM

Sell, through a federal mechanism, exclusive rights to biological controls to private IPM enterprises in order to increase the use of IPM.

TESTING BY GOVERNMENT

22. EPA Screening/Testing of Innovative Pesticides

Arrange testing of promising innovative pesticides without compromising the proprietary position of the developer in order to reduce testing costs. (Modeled after the drug screening programs of the National Cancer Institute.)

23. Government Funding of Environmental and Residue Testing for Minor Crop (and Specialty) Pesticides

Fund environmental and residue testing of minor crop pesticides at non-government organizations in order to reduce product development costs to companies.

24. Government Generation of Environmental and Residue Data for Minor Crop and Specialty Pesticides

After submittal by pesticide developer of efficacy and toxicity data, USDA or EPA conduct environmental and residue testing necessary for registration.

25. Efficacy Screening of Potential Pesticides

Conduct either primary or field efficacy screening of potential pesticides at government laboratory (USDA) for a standard fee.

26. Government Testing of all Registration Parameters

Provide a government service and facilities for testing of those parameters required for registration. Charge fees consistent with costs of in-house testing by pesticide industry.

27. Government Certification of Private Laboratories for Testing of Pesticides

Certify private laboratories for pesticide testing in order to guarantee acceptability of results for registration.

28. Government Large-Scale Field Studies of Generic Representatives of Innovative Pesticide

Provide to industry the results of large-scale government testing of generic pesticides; accept data as part of registration requirements for pesticides in the class.

29. EPA Generation of Additional Registration Data

Following completion by the applicant of all tests required for registration, conduct additional testing in government laboratories or under contract to EPA.

GOVERNMENT-SPONSORED R&D

30. Government Sponsorship of Commercial R&D on Biological Controls

Federally sponsor R&D by commercial companies on biological controls in order to develop more products, as well as to strengthen company skills in this approach to pest control.

31. Increase EPA Funding of R&D

Substantially increase EPA funding of R&D, emphasizing innovative pesticides and potentiation of new and existing pest control methods.

32. Government Funding of Basic Research

Fund a coordinated program of long-range basic research, under government sponsorship, on new pest control methods.

33. Government Funding of Applied Research

Fund a coordinated program of applied research under government sponsorship, on new pest control methods.

34. Government Funding of Research on Formulation and Application Methods

Fund, by the government, research to increase the cost effectiveness of pesticide applications, by means of safer formulations and better application methods.

35. Definition of Standards for Safety

EPA clarify the concept of "safety" and its requirements for registered pesticide products, both within EPA and through more EPA participation in ASTM's Pesticide Committee and ANSI's new Environmental Council.

EDUCATION, TRAINING AND INFORMATION

36. Training of Farmers and Applicators

Promote new methods of safe and effective pesticide use by conducting seminars and other training for farmers and applicators via their own organizations or state extension services.

37. Independent Pesticide Research Foundation

Set up an independent, non-profit organization through collaboration of government and industry to disseminate impartial information and conduct a responsible public education program.

38. Federal Marketing of Pest Control Approaches

Increase public knowledge and acceptance of innovative pesticides by cooperative federal-industry programs of providing information, advertising and marketing.

39. Improvement in EPA Contacts with Congressional Overseers

Increase and regularize information flow between EPA and Congress in order to increase the understanding of the Congress and judiciary of pest control and regulation problems.

FUNDING AND REIMBURSEMENT OF INDUSTRIAL DEVELOPMENT

40. Clearinghouse for Research Results

Encourage companies to disclose unsuccessful research efforts through a research information clearinghouse by reimbursing some portions of the research costs.

41. Research Investment Credit

Create a tax credit similar to the current investment credit, allowing a company to offset directly its tax liability by 10 percent of the capital investment in research during the year, providing that the total does not exceed 50 percent of the pretax profit.

42. Direct Subsidy of Research

Government subsidize the entire cost of R&D and registration of pest control methods that are innovative, aimed at minor crops, or otherwise not commercially attractive. Sale of patent rights by EPA, with first refusal granted to the developer.

43. Reimbursement of Registration Costs for Pesticides for Minor Crops

Increase the availability of pest control agents for minor crops by reimbursing costs of registration of already proven agents (i.e., those registered or other crops/insects) on specific minor crops lacking alternative methods.

44. Repayment Loan Fund for Pesticide R&D

Provide a continuing source of capital investment funds for R&D of pest control methods by establishing federal loans to industry for safety and environmental testing. Repayment of the loans is based upon product success.

45. Low-Interest Government Loans

Through low-interest loans from the government, provide funds for safety and environmental testing on desirable pest control methods.

PENALTIES

46. Water Residue Tax

Assess pesticide manufacturers with a tax based on the amount of pesticide residues found in monitoring of water bodies and rivers.

47. Safety Tax

Create a tax on pesticides paid by manufacturers, based on the toxicity (e.g., LD_{50}) and/or persistence (e.g., half-life in aquatic muds).

48. Pesticide Use Tax

Charge pesticide users a use tax based on criteria such as toxicity, environmental parameters, safety, etc., fund research with tax revenues.

PRODUCT PROTECTION/PROPRIETARY POSITION

49. Modification of Patent Issue Date and/or Duration

Provide, through modification of the patent process, a specified period of product protection, taking into account delays caused by the government, and thereby encourage industry to develop new products.

50. Proprietary Protection for Biological Pest Control and IPM

Encourage commercial companies to develop biological control and IPM methods by protecting (either through patents or the product registration process) R&D efforts and resultant products in the marketplace.

51. Commercialization of Pesticide Products Developed By or For the Government

Through more liberal policies for selling and exclusive licensing, facilitate the commercialization by industry of potential products (primarily biological controls) for which the original R&D was accomplished by or under contract to the government.

MARKET STIMULATION/PRODUCT DEMAND

52. Aggregation of Public Sector Market Demand

Use of the combined purchasing power of all federal agencies (plus possibly state agencies) to encourage the development of new pest control methods.

53. Aggregation of Government Markets for Pesticides

Variation of above. Stimulate the development of new pest control methods by eliminating price from government procurement performance specifications and by basing specifications solely on criteria such as efficacy, toxicity, and safety.

54. Aggregation of Government Markets for Foodstuffs Grown with Desirable Pest Control Methods

Stimulate pest control research and development through inclusion of the pest control methods used during production in the performance requirements for foodstuffs purchased by federal agencies.

55. Influence Pesticide Markets by Education and Food Product Labeling Foodstuffs Grown with "Safe and Effective Pest Control Methods"

Influence pesticide markets by increasing the civilian market demand for foodstuffs grown with certain pest control methods through education programs and mandatory labeling of foodstuffs.

56. Government Performance of Market Analyses

Reduce uncertainties concerning long-term markets for pesticide products by government analysis of markets, competing products and processes, and prospective public regulations.

57. Subsidies or Price Support for Crops Raised with Desired Pest Control Products or Methods

Provide direct subsidies or crop price guarantees for private users of integrated pest management and other innovative and safe pest control methods.

58. Expansion of Extension Service Program

Stimulate user demand for effective and safe products and methods by use of State Extension agents to assist with the informed selection and use of pest control methods.

59. Increase Foreign Markets for U.S. Pesticide Products and Processes

Initiated by EPA, explore foreign markets for safer and more effective pest control methods developed in the U.S. Eventually expand the market for these products.

60. Expansion of the Number and Role of Independent Pest Management Consultants

With USDA or EPA support, increase the number and role of pest management consultants; also develop total performance pest management service organizations in order to aid the farmer and influence pest management practices.

61. Safety Index

Include safety index on pesticide labels to enable consumers to compare relative safety characteristics of the available pesticides.

OTHER

62. Independent Pesticide Broker

Establish an independent organization to buy and sell information and data on existing and potential pesticides; rights and licenses to specific products; and other information on products, uses, and application.

63. Collaborative Industrial Efforts

In order to encourage collaborative R&D by companies on new, high-risk innovative products, eliminate any regulatory or legal barriers and, if necessary, provide economic incentives for such effort.

64. A Pesticide Development Award

Establish a prize/award to be given by EPA each year for the outstanding innovative pesticide development.

APPENDIX F

RESULTS OF INITIAL SCREENING OF INCENTIVES

Incentive Title	Score		
	ADL	EPA	ETIP
INSURANCE/LIABILITY			
1. Insurance for Minor Crops	Questionable	Good	Good
2. Government Insurance for Farmers Using Improved Pest Control Methods	Questionable	Good	Good
3. No-Fault Tolerance	Questionable	Bad	Bad
4. Insurance for Unsuccessful Product Development	Bad	Bad	Bad
5. Product Failure Insurance	Bad	Good	Good
6. Reinsurance	Questionable	Good	Good
IR-4			
7. Supplemental Funding for IR-4	Questionable	Good	Good
8. Residue Journal	Questionable	Questionable	Questionable
9. Crop Groupings for Minor Crops	Good	Good	Good
10. Insurance for IR-4	Questionable	(should be integrated with liability)	
INTEGRATED PEST MANAGEMENT - BIOLOGICAL CONTROL			
11. Government Support To Users of a USDA IPM Service	Questionable	Good	Questionable
12. Subsidy for IPM	Good	Good	Questionable
13. Rights to IPM	Good	(concept of rights needs more investigation)	
14. Reorganization of USDA Research on Biological Control	Bad	Bad	Bad

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Incentive Title	Score		
	ADL	EPA	ETIP
15. IPM Copyright	Questionable	Bad	Bad
REGISTRATION CHANGES			
16. Reduce Registration Time for Safe Products	Questionable	Good	Good (given good criteria)
17. Facilitate Registration Process for Innovative Products	Questionable	Review in working paper	
18. Reduced Registration Requirements for Biological Controls	Good	Not Resolved	Not Resolved
19. Decreased Uncertainties of Registration Process for Applicants	Good	Not Resolved	Not Resolved
20. Reduced Time and Cost of the Registration Process	Good	(review in working paper)	
21. Registration of Only the Safest and Most Effective Product for Each Use	Bad	Bad	Bad
22. EPA Screening/Testing of Innovative Pesticides	Questionable	Questionable/Bad	Good
23. Government Funding of Environmental Testing for Minor Crop (and specialty) Pesticides	Good	Good	-
24. Government Generation of Environmental and Residue Data for Minor Crop and Specialty Pesticides	Questionable	Good	Good
25. Efficacy Screening of Potential Pesticides	Questionable	Bad	Bad
26. Government Testing of All Registration Parameters	Questionable	Bad	Bad

Incentive Title	Score: ADL	Score: EPA	Score: ETIP
27. Government Certification of Private Laboratories for Testing of Pesticides	Questionable	Bad	Bad
28. Government Large-scale Field Studies on Generic Representatives of Innovative Pesticides	Bad	Questionable	Bad
29. EPA Generation of Additional Registration Data	Questionable	Bad-Good	Good
30. Government Sponsorship of Commercial R&D on Biological Controls	Good	Not Resolved	--
31. Increase Funding of R&D	(not appropriate incentive)	--	--
32. Government Funding of Basic Research	Good	Bad	Bad
33. Government Funding of Applied Research	Bad	Questionable	-
34. Government Funding of Research on Formulation and Application Methods	Good	Review in working paper	
35. Definition of Standards for Safety	Questionable	Good	Good
EDUCATION, TRAINING AND INFORMATION			
36. Training of Farmers and Applicators	Questionable	-	(if not done, explore)
37. Independent Pesticide Research Foundation	Bad	-	Bad
38. Federal Marketing of Pest Control Approaches	Bad	-	Bad
39. Improvement in EPA Contacts with Congressional Overseers	Questionable	Questionable	Bad

	Incentive Title	Score		
		ADL	EPA	ETIP
	FUNDING AND REIMBURSEMENT OF INDUSTRIAL DEVELOPMENT			
40.	Clearinghouse for Research Results	Questionable	Questionable	Good to idea; Bad to mechanism
41.	Research Investment Credit	Good	Bad	Questionable
42.	Direct Subsidy of Research	Questionable	--	--
43.	Reimbursement of Registration Costs for Pesticides for Minor Crops	Good	Good (if USDA)	Good
44.	Repayment Load Fund for Pesticide R&D	Questionable	--	--
45.	Low Interest Government Loans	Good	--	--
	PENALTIES			
46.	Water Residue Tax	Bad	Bad	Bad
47.	Safety Tax	Questionable	Bad	Bad
48.	Pesticide Use Tax	Bad	--	--
	PRODUCT PROTECTION/PROPRIETARY POSITION			
49.	Modification of Patent Issue Date and/or Duration	Good	Good	Good
50.	Proprietary Protection for Biological Pest Control and IPM	Good	Questionable	Good
51.	Commercialization of Pesticide Products Developed by or for the Government	Good	-	-
	MARKET STIMULATION/PRODUCT DEMAND			
52.	Aggregation of Public Sector Market Demand	Questionable	Good	Good
53.	Aggregation of Government Markets for Pesticides	Questionable	Good	Good
54.	Aggregation of Government Markets for Foodstuffs Grown With Desirable Pest Control Methods	Bad	Questionable	Questionable

Incentive Title	Score		
	ADL	EPA	ETIP
55. Influence Pesticide Markets by Education and Food Product Labelling Foodstuffs Grown with "Safe and Effective Pest Control Methods"	Bad	Bad	Bad
56. Government Performance Market Analyses	Bad	Bad	Bad
57. Subsidies or Price Support For Crops Raised with Desired Pest Control Products or Methods	Questionable	Questionable	Questionable
58. Expansion of Extension Service Program	Needs further development		
59. Increase Foreign Markets for U.S. Pesticide Products and Processes	Bad	Bad	Bad
60. Expansion of the Number and Role of Independent Pest Management Consultants	Questionable	Good	-
61. Safety Index	Needs development	-	-
OTHER			
62. Independent Pesticide Broker	Questionable	Questionable	Questionable
63. Collaborative Industrial Efforts	Good	Questionable	Bad
64. A Pesticide Development Award	Good	Questionable	Bad

Notes: - Indicates no ranking given.

APPENDIX G

PRELIMINARY WORKING PAPERS*

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[*] In this Appendix, selected preliminary working papers are presented. These papers were circulated to representatives of industry, government, and other groups as part of the incentive development and evaluation process. Not all of the original 64 incentives (Appendix E) were developed into preliminary working papers. Only the working papers of those incentives which were not developed further or incorporated in the final incentives (Part Two of Volume I) are presented here.

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GOVERNMENT INSURANCE FOR MINOR CROPS

SUMMARY

Insurance companies are frequently reluctant to provide insurance for entirely new pesticides for which little actuarial data is available and which carry a risk of large claims. Small and new companies in the pesticide industry are most likely to have difficulty in obtaining coverage or to have to pay high premiums.

The aim of this incentive is to foster the development, registration, and distribution of innovative pesticides that involve a lessened risk to the environment and human health and safety.

The government would set up a reinsurance system to encourage insurance companies to cover pesticide companies for major and catastrophic losses due to product failure and product-related accidents from the introduction of innovative pesticides. Further, the government would provide similar coverage for minor crops through a no-fault insurance system.

OBJECTIVES

The purpose of this incentive is to encourage pesticide companies to develop, register, and distribute innovative pesticides by providing special insurance protection for major and catastrophic losses because of large suits due to product failure and product-failure-related accidents.

The introduction of new and innovative pesticides that differ significantly from prevailing products, such as, for example, biological controls, involve unknown risks on which actuarial data has not been accumulated. Insurance companies are reluctant to insure such products, and, if they do, the insurance premium is apt to be high. This affects adversely small companies, new companies, especially if they have been established to manufacture an innovative product, and non-diversified companies. This incentive would help EPA to achieve its goal of fostering the development of innovative pesticides that serve to protect the environment and human health and safety, as well as that of developing an adequate supply and variety of pesticide control methods. The incentive would also contribute to the profitability of pesticide companies of all sizes. This incentive would benefit also agriculture, especially because it would foster the development of pesticides for minor crops.

EXPECTED OBSERVABLE RESULTS

An insurance program of the type envisaged here could probably be implemented within one to two years, since it would build into the existing insurance system. The results, would be long-term, bringing about new pesticides, uses, and registrations after five years, although some short-term effects may occur because some products that are now in the R&D stage may be introduced faster.

Government Insurance for Minor Crops, Cont'd

DESCRIPTION AND IMPLEMENTATION

The main thrust of this incentive is to protect pesticide companies against major and catastrophic losses from product failure and product failure associated accidents. This insurance would not cover losses due to environmental damage since this risk is dealt with in the registration process and since the aim is the development of pesticides that cause less environmental and human health damage.

This incentive would be provided only to new products for which actuarial data had not been accumulated for a period of perhaps three to five years. However, natural market forces will remove ineffective or high risk products during that time. Furthermore, insurance would not be used to maintain a product that incurs large product failures.

A reinsurance system, to be administered and covered by the USDA or EPA, would compensate insurance companies for their insurance coverage of pesticide companies. The insurance coverage would be for new products, for any or all crops or uses once registration had been achieved. Reinsurance would encourage insurance companies to offer the desired insurance at premiums acceptable to pesticide companies.

The liability for product failure is the same for pesticides developed for minor crops as for major crops. Since the sales of pesticides in the minor crop market are small, pesticide companies have a disincentive to develop pesticides for these markets. An insurance program especially designed to encourage companies to develop pesticides for this market would be one that is based on a no-fault system. Such a system might be administered and covered by Federal Crop Insurance Corporation (FCIC) which already insures farmers. A no-fault system is one in which the insuror covers the insuree for damage that the insuree sustains from a third party. Thus, in a no-fault system insurance is to be provided the farmer for damage he sustains from the failure of a product of a pesticide company. Such a system not only relieves the pesticide company from the risk of product failure, but it also encourages the farmer to use new pesticides because any damage will be recovered easily and quickly. This coverage could be written for new products registered specifically for minor crops or uses or for existing products that are newly registered for these uses.

REQUIREMENTS FOR SUCCESS

The administrative costs of such an incentive would not be excessive. The reinsurance system involves setting up administrative capability within the government but most of the work would be carried out by the existing private insurance industry. The no-fault system would be added on to the existing FCIC. Although no-fault insurance would be an added burden, the settlement procedures are simpler than under a regular insurançe system. The chief expense to the federal government for such an incentive would be the expense of covering the insurance claims. The magnitude of possible claims is unknown and needs further study.

GOVERNMENT INSURANCE FOR FARMERS USING IMPROVED PEST CONTROL METHODS

SUMMARY

This incentive is designed to reduce the economic risk to farmers using improved pest control methods by a crop insurance program administered by an existing USDA agency. The program would be relatively easily evaluated, but require large cash reserves and stringent requirements for success.

OBJECTIVES

The objective of this incentive is to hasten the adoption of improved pest control techniques that represent significant departures from present methods and thus substantial economic risk to the user because of lack of familiarity with the technology and its effectiveness. With acceptance of improved techniques by agriculture, the pesticide industry will have an incentive to continue research and development of such techniques.

EXPECTED OBSERVABLE RESULTS

The results of this incentive are relatively easily defined and evaluated. Within the first two years of use, it is expected that farmers' acceptance of the insurance program will be evident. Assuming sufficient farmer acceptance, the relationships between insured farmers in an area and subsequent general implementation of the new pest control technique can then be measured quantitatively. The probability of success would be enhanced by the fact that the likely users of this program would be the successful, innovative farmers who are leaders in technology adoption within the crop commodity that they raise.

DESCRIPTION AND IMPLEMENTATION

The design of this program is similar to that of two existing USDA programs: the Federal Crop Insurance Corporation and the Diaster Payment Program administered by the Agricultural Stabilization and Conservation Service. Thus, an administrative structure will likely be in place in almost all areas of use.

It should be noted that the purpose of this program is not to protect industry from liability due to improper testing or formulation of its pest control products, but rather to protect the farmers from economic risk while trying out a new pest control method.

The major steps in implementation would be:

- definition of pest control methods insured under this incentive and period of insurance,
- an education program to acquaint farmers with the incentive,

Government Insurance for Farmers Using Improved Pest Control Methods, Cont'd

- insurance (without cost) to participating farmers,
- field monitoring of factors unrelated to the pest control method which affect crop yield,
- assessment of acceptance of the pest control method following discontinuance of the insurance.

REQUIREMENTS FOR SUCCESS

The requirements for success of this incentive are stringent. Both timely decisions on cause (pest control method or not) for loss and magnitude of loss of insured crops and timely payment for losses are essential. Potentially substantial loss because of misuse of the pest control method by the farmers will also have to be covered and a large reserve fund established for potential losses. An effective policy on pest control methods to be insured and the period of insurance must be developed. Further, the liability of the government and the organizations which write the insurance policies must be differentiated.

GOVERNMENT SUPPORT TO USERS OF USDA IPM SERVICE

SUMMARY

This incentive would consist of the creation of local IPM advisory services using USDA extension service personnel and the development and implementation of a mechanism for federal financial support to users of these services.

OBJECTIVES

Implementation of this incentive would encourage the use of IPM practices, which could be expected to:

- decrease the usage of traditional pesticides (especially excess amounts applied due to over-reaction to a potential or perceived pest problem),
- protect populations of beneficial insects which act as a natural check on pest populations,
- decrease the build-up of resistance of pest populations to traditional pesticides, and
- decrease the costs of pest control to the user, both financial and in terms of unexpected, secondary effects, e.g. phytotoxicity caused by traditional pest control practices.

Farmers wishing to use IPM practices would find the necessary consultation services readily available for a minimal cost, if any, and receive financial benefits, both from reduced purchases of pesticides and from government financial support.

An additional benefit would be a change in the status of IPM from an experimental one, to incorporation in good agricultural practices. This would, in turn, signal to developers of pest control methods that suitability of their products for use in IPM programs will be a requirement for future success of their products.

EXPECTED OBSERVABLE RESULTS

The actual increase in usage of IPM would depend on the magnitude of the government subsidy, as well as the success or applicability of IPM for particular crops. With a significant government subsidy, perhaps 50% of the agricultural groups or individual farmers involved in crops that have been shown through demonstration projects to be amenable to IPM practices might begin to use those practices. For crops that have not been the subject of IPM demonstration projects, only 20% of those farmers and agricultural groups might be expected to begin IPM practices. Overall, the reduction in usage of traditional pesticides probably might be 10%. The decrease in pest resistance, damage to natural predators, and overall environmental impact would be difficult to quantify.

Government Support to Users of USDA
IPM Service, Cont'd

DESCRIPTION AND IMPLEMENTATION

The current state extension services would be expanded to include two or three additional field personnel specializing in pest control for every current such person. These probably should be entomologists or agronomists with special expertise in integrated pest management. Additionally, these persons should be allowed to hire local field workers for necessary monitoring activities of IPM.

Since integrated pest management is an activity which requires week-by-week monitoring and information gathering from individual fields, these field persons responsible for IPM would not be able to provide these services for any and all who ask for them. Each of these IPM field persons, therefore, would have a case load of 20 to 25 farmers involving a maximum of, e.g.,10,000 acres. Once a year there would be an opportunity to sign up for this service on the first come, first served basis.

Another function of the IPM personnel is coordinating pest control methods on an area basis to assure that methods do not counteract each other. The IPM personnel could point out the problems to the user of the traditional pest control method; actual stoppage of usage of that traditional pest control would involve difficult legal implications. This coordination activity is a recognized need in many parts of the country. Farmers would sign up voluntarily to participate in the service, receiving federal support either by direct subsidy, tax credits, or returns from IPM practices. This support can be a single predetermined amount guaranteed to the farmer if he completes the IPM program, with additional amounts guaranteed if the IPM practices don't work (i.e., if the pest wipes out the crop). These additional amounts would be given out only in the case of massive failure rather than slightly decreased yields which may not be traceable to pest problems.

Both extension service personnel and participating farmer would monitor and record the purchases of traditional pest control methods and evaluate the effectiveness of this program in reducing the amounts of traditional pesticides used.

REQUIREMENTS FOR SUCCESS

The resistance of some USDA extension service personnel to IPM must be overcome. An exchange of information between the promoters of IPM and the field personnel who are experienced in the realistic limitations must be established. Since the private IPM services are an inherent part of the future success of IPM, their interests would have to be considered and their participation in the program encouraged. This incentive must be integrated and coordination with other incentives, specifically with insurance incentives that may provide financial guarantees to farmers using non-traditional pest control methods.

REDUCED REGISTRATION TIME FOR SAFE PRODUCTS

SUMMARY

This incentive is an attempt to reduce the duration of the EPA registration/review process for selected new pesticide products that meet specific safety criteria. Initially EPA would establish a system to classify "safe" pesticides. An accelerated registration process for these products could be high-priority consideration or "temporary" registration with rapid (2-3 month) disposition of the application.

OBJECTIVES

The time consumed by data gathering, submission of application, and EPA review is frequently mentioned by industry as an impediment to the research and development of new pesticides. Even for pesticides that are considered "safe" (in terms of mammalian toxicology and environmental effects) often the EPA review and resubmittal of data take six to twelve months (or longer) before registration is approved. This incentive would accelerate the registration process for those pesticide products meeting rigorous standards of safety and demonstrate EPA's desire to accommodate the needs of the pesticide industry.

EXPECTED OBSERVABLE RESULTS

This incentive could have both near- and long-term results. In the near term, certain pesticide products now in the registration or reregistration process could probably be approved more quickly. This might allow industry to achieve registrations without loss of another "growing season" and without the inevitable additional costs of delays. A longer term result of this incentive might be the development of criteria defining "safe" pesticides and representing a stable target for R&D efforts by the pesticide industry.

DESCRIPTION AND IMPLEMENTATION

Implementation of this incentive would require first the development of simple and practical criteria according to which both EPA and the potential registrant could determine whether a given pesticide product would qualify for accelerated registration. The criteria could be those used to distinguish between general-use and restricted-use pesticides or some subset of the general-use category defined by parameters such as oral, dermal or inhalation toxicity, and persistence.

After establishment of these criteria, EPA could accelerate the registration process by assigning a special registration staff to handle priority applications. Alternatively a temporary or provisional registration could be granted after cursory review, since the initial criteria for accelerated registration should reduce much of the risk of toxicity to humans or environmental damage; final registration could be effected at a later time. EPA would be required to meet scheduled review dates and report to the public the results of the accelerated registration process.

REQUIREMENTS FOR SUCCESS

The success of this incentive will depend on both industry and EPA. Industry will have to accept the premise that some pest control products are likely to be safer than others and that this is a valid reason for accelerated registration. EPA, on the other hand, will have to "promote" certain classes of pesticides in preference to others, (and maintain) long-term standards for safe products, and establish an accelerated review process even though a greater risk may be involved Of course the incentive also requires that industry continue to develop potential products that can be categorized as "safe." This incentive might be combined with others that give priority to biological control approaches or otherwise to reduce the time and cost of the registration process.

REDUCED REGISTRATION REQUIREMENTS FOR BIOLOGICAL CONTROLS

SUMMARY

This incentive would reduce the requirements and time for registration of biological control methods by modification of some current procedures for application review, giving priority to those applications for registration of the desirable methods.

OBJECTIVES

Through this incentive, EPA would seek to increase the number of biological pest controls currently on the market, since

- these controls are generally safer and more target specific than chemical controls,
- they are generally considered to be innovative, and
- FIFRA 1972 directs EPA to promote biologically integrated pest control methods.

Companies wishing to register biocontrols would gain an opportunity to decrease the time and cost of registering their products (decreasing the total time and cost of developing the control method). With an attitude of cooperation expressed by EPA, companies might be encouraged to proceed with biological controls, regardless of the actual decrease in regulation time and cost.

EXPECTED OBSERVABLE RESULTS

Two major results would occur. The number of registered biocontrols would increase, the exact numbers depending on the current state of technical and commercial development of biological controls, as well as the status of other limiting factors. The rate of registration might increase from one year to two per year, with about three or four registrations in the first year because of a small backlog of technically ready methods. The time and cost of registering biological controls would decrease. A rough estimate might be about a one-third reduction in time and a 10-20% reduction in cost (from decreased test requirements).*

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*This latter estimate may be high considering the fact that EPA, in trying to make the requirements more relevant to biological controls, added about 10% more requirements in two out of the five types of biological controls reviewed.

The actual time and cost (estimated) should be monitored.

DESCRIPTION AND IMPLEMENTATION

This incentive would facilitate registration of biological controls by several changes in the current registration process.

Currently biological control specialists are scattered throughout the Registration Division. The only one, however, who is active in biocontrol registrations on a regular basis is "Product Manager #17," located in the Insecticide Product Branch, who coordinates the review of all biological control submissions. The technical review branches (e.g., Ecological Effects, Toxicology, and Efficacy) do not now have persons officially designated to review biological control petitions.

At least one person in each of the review branches should be familiar with the full range of biological controls and take responsibility for the review of these methods.

Currently all submissions are reviewed on a first come, first served basis, according to the date stamped on the submission when it first comes into the Registration Division from the mailroom.

In order to speed up the review process for biological controls, the technical review should begin as soon as the submission is received by the technical review branches and continue uninterrupted until completion. This would require that priority be given to the review of submissions concerning biological control.

Questions that arise during registration sometimes stem from the particular nature of the type of control. For instance, the concern about the possible effects of juvenile hormones on other hormonal systems (e.g., mammalian) has arisen often enough that EPA has funded a study on the subject. OPP should review the test requirements for each of the types of the biological controls during the initial implementation of this incentive and every few years thereafter, to determine which tests, if any, can be done by EPA on a generic basis.

Currently EPA is going through the registration guidelines for each of five types of biological controls (viruses, pheromones, fungi, bacteria, and insect growth regulators), eliminating any that are not relevant. At the same time, they are writing "guidance" (as opposed to "guidelines" which must be published in the Federal Register) outlining additional tests relevant to each type of biological control. The resulting total test requirements are expected to be slightly less than before for viruses, bacteria, and fungi, and slightly more extensive than before for pheromones and insect growth regulators.

No matter what the actual increase or decrease in test requirements, the increased relevancy of the requirements will itself help the registration process for biological controls. However, this incentive should include significant decreases in the total testing, or costs of testing, required, even if this increases the risk in EPA decision-making.

Implementation of the incentive would require first a common agreement within EPA on the definition of biological controls and a policy position, e.g., promotional or non-promotional. Guidelines, and new "guidance" would be reviewed in light of EPA's position in order to determine whether requirements should or should not be reduced. Generic tests for each type of biological control which could be funded by EPA would be identified. Additional staff would be hired for the technical review branches and trained in the full range of biological controls. Finally, review of submissions for biological controls would have to take priority over review of other submissions.

REQUIREMENTS FOR SUCCESS

The major requirement for the success of this incentive is the assumption by EPA of a promotional position toward biological control methods. Furthermore, this incentive is not independent of other incentives in that its success (increased biological controls) requires the elimination of possibly more important limiting factors (such as the lack of proprietary protection).

It must be coordinated with other incentives that deal with the registration process in general, particularly the one that seeks to decrease the time and cost of registration for all products.

GOVERNMENT FUNDING OF ENVIRONMENTAL AND RESIDUE TESTING FOR MINOR CROP AND SPECIALTY PESTICIDES

SUMMARY

The EPA or USDA would serve a management role responsible for the environmental and residue testing of pesticides intended for minor crops or minor uses. Actual testing would be carried out, at government expense by non-governmental organizations using as a structural model the drug screening activities of the National Cancer Institute. Materials submitted would have previously been shown by the submittor to be efficacious and of acceptable toxicity. The program would not compromise the proprietary position of the pesticide developer. This incentive can be projected to decrease the relative cost of commercialization of pesticides for minor crops and minor uses. It might also allow pesticide development by parties outside of the existing agrochemical complex.

OBJECTIVES

The EPA and USDA would increase the availability of pesticides for minor crops and minor uses by decreasing the relative cost of commercialization of such pesticides. The pesticide developers and existing manufacturers would gain from this incentive by receiving a means, at government expense, for the environmental and residue testing of pesticides intended for minor crops and minor uses. In addition, it is expected that some pesticide developments would be stimulated by the availability of such no cost testing. This latter goal would apply specifically to materials of known toxicity but for which the venture capital might be dependent upon adequate field testing.

EXPECTED OBSERVABLE RESULTS

The primary benefit to be expected would be the increased registration of pesticides adequate for minor crop use. With an annual funding level of $10 million, this program might allow the registration of at least 100 pesticide/minor use combinations per year. If priority were given to the most important pesticide problems, a high proportion of these 100 potential registrations would result in the marketing of needed products. Thus greater diversity and availability of products for minor crops and minor uses could be envisioned, to the benefit of the agricultural establishment, the environmental interests and, on a selective basis, the agrochemical industry.

DESCRIPTION AND IMPLEMENTATION

Upon passage of enabling legislation or appropriate executive approval, the EPA or USDA would serve as a conduit for environmental and residue testing of selected pesticides. The field studies would be conducted under contract and involve only minor crops (less than $200 million commercial value annually) and minor uses (such as pesticides for right-of-way clearance, structural use, and protection of stored products). The criteria for selection of submitted pesticides for inclusion in this program would be evidence of the compound's efficacy, and toxicity information equivalent to that required for registration.

The testing would be carried out by non-governmental organizations under contract to the sponsoring executive agency (EPA or USDA). Protocols would be established by the executive agency for the specific tests to be conducted and RFP's would be let.

The model for the relationship between individuals or companies submitting compounds, the regulatory agency and the contract testing organization would be the drug screening activities of the National Cancer Institute. This model addresses such questions as the patent policy applicable to industrial and research contracts, including an effective policy statement on confidential compounds.

The NCI policy makes possible the evaluation of many thousands of compounds that would not be readily available on an open basis for screening of potential cancer chemotherapeutic agents. An analogous policy statement would hopefully allow equally successful results to occur insofar as needed pesticides, addressing such questions as confidentiality, publication of data, expert consultation and patent policy. Thus, the supplier of compounds would suffer no loss of rights and privileges as a result of participation in the environmental and residue testing program, and the government would seek no assignment of rights from suppliers of materials.

The sole involvement of the executive agency would be as stated previously, as a conduit. Materials submitted with the accompanying efficacy and toxicity data would be assigned to a contractor for testing on a particular minor crop or for a particular minor use. The resulting residue data (and environmental data if the material or use so required it) would be funnelled back through the executive agency to the submittor. The submittor could make use of such data as he saw fit, either as part of a registration or even as a basis for the generation of investor interest.

The implementation of this incentive is expected to be straightforward. Although the EPA would, on the one hand, be the most likely agency to administer the program because of its knowledge of specific minor crops and minor uses for which there were environmental concerns, it is understandable that this agency might not be appropriate for the program because of the possible conflict between its regulatory role with what would appear to be a promotional role. In this case, the USDA might well be responsible.

The USDA would have to develop protocols for the environmental and residue testing of important minor crops and minor uses. Upon completion of this task, RFP's would be issued and prospective contractors would propose to conduct a specified level of testing. Once such contracts had been issued (presumably on a cost-plus-fixed-fee basis dependent upon level of testing activity) the required mechanism would exist. The sole remaining task would be the creation of an executive committee to determine the priority of specific minor crop and minor use problems and the potential success (based upon efficacy and toxicity data) of submitted compounds in solving such problems. The composition of the committee might be similar to that of the existing federal pesticide working group.

REQUIREMENTS FOR SUCCESS

One prerequisite for success is a minimum annual budget of $10 million and a program lifetime of at least five years. A further requirement, of course, is that the responsibility for directing and supporting such a program could be resolved between EPA and USDA. Contractors would probably be available from industry and academia to perform the testing. The major concern, then, is whether, in fact, companies would submit compounds for testing. Many compounds now registered for major uses would be expected to be funnelled through this program as a means of helping the management of industrial organizations determine the advisability of submitting applications for minor crops.

The extent to which compounds would be submitted for minor crops or minor uses from existing agrochemical companies vs. small companies or developers interested in entering the pesticide industry is unknown. A mix between these two groups would tend to further the overall effectiveness of the program.

GOVERNMENT GENERATION OF ENVIRONMENTAL/RESIDUE DATA FOR MINOR CROP AND SPECIALTY PRODUCTS

SUMMARY

After submittal and acceptance of efficacy and toxicity data for minor use registrations, USDA (or EPA) will conduct residue and environmental tests on potential products for minor and specialty uses. The incentive will help pesticide developers market products for minor uses more profitably and aid agriculture through increased availability of products for minor crops and other specialty uses.

OBJECTIVES

Development of pest control products for minor markets--crops or specialty applications--is generally regarded by industry as a high-risk, low-profit venture. This is a result of the small potential market combined with the high costs of development and registration testing, which are essentially the same whether the potential market is large or small. This incentive would reduce the development costs of pesticides for the minor markets by requiring EPA or USDA to conduct residue and environmental tests on potential products once efficacy and safety (toxicity) data had been submitted by industry. Reduction of the cost of development, will increase the funds available for synthesis, screening, and other portions of the pesticide development process.

EXPECTED OBSERVABLE RESULTS

Within three to five years, this incentive should lead to more pesticides registered for minor uses. Industry, will consider the minor use part of the pesticide market more profitable, devote more of its efforts to products for this market, and thus benefit agriculture. Reregistration, currently in progress, is expected to remove from the market many products that are now registered for minor crops; this incentive could help reinstate many of those products. A longer term result would be the development of additional pesticide products for other than minor uses, as funds now spent on marginally profitable products were diverted to new product development.

DESCRIPTION

This incentive differs only slightly from other methods of subsidizing the costs of safety or environmental testing required for registration. In its present concept, the USDA (EPA)--using its own facilities, laboratories and staff or with the aid of the experiment station at state universities--would conduct residue tests and any necessary environmental tests on pesticides for which applications have been submitted for minor-use registration. The pesticide developer would be required to submit efficacy and toxicity test data acceptable for registration. (Presumably much of the toxicity data will already have been submitted to EPA as part of the registration of the product for a major use.) USDA (EPA) would then conduct residue and environmental tests within a specified time frame, providing these data to the developer for use in full registration application.

The conduct of the tests by the government will neither guarantee results acceptable for registration nor preclude an applicant from submitting his own data. Further, a developer would not be required to complete his application for registration for the minor use although a penalty might be charged, (e.g., requested payment for 1/2 the testing cost) if the test results provided by the government were not used. Proprietary positions would not be compromised by use of government-generated data.

REQUIREMENTS FOR SUCCESS

To be successful, EPA must define (and industry accept) the range of minor uses to which this incentive will apply. Dollar value of the crop or value of the pesticide market might be criteria for this classification or definition. A system and method for conduct of the residue and environmental tests must be established, perhaps as an expansion or modification of the IR-4 program or the USDA laboratories. The government agencies must be willing to adhere to fixed schedules for conduct of the test efforts. Industry must be willing to relinguish the control over the tests to the government agency in return for the cost of tests. Finally, other problems such as product liability will require consideration and solution before industry may be willing to participate in this program, even with the reduced cost of testing.

EPA GENERATION OF ADDITIONAL REGISTRATION DATA

SUMMARY

This incentive will require that EPA delineate carefully all tests required for registration of pesticides, maintaining the same requirements for a specified time period. Any additional test data required, as a result of the review of specific applications, would be generated by the EPA or other federal agencies at EPA expense on a timely schedule if the applicant did not desire to submit this additional data.

OBJECTIVES

The uncertainty in test requirements for registration, additional or serial testing after submittal of initial application, and the resultant delays in the registration process are mentioned frequently by industry as a disincentive for more active R&D on new pesticide products.

EPA has attempted to reduce or eliminate this uncertainty through publication of Section 3 regulations and guidelines that define to a much greater extent than previously the required test program and the data needed for registration. Nevertheless, based on past experience, industry anticipates that caution on the part of EPA reviewers and their inherent aversion to risk will still result in additional data requirements and delays in following submission of a registration application. The objective of this incentive is to ensure that EPA specifies its data requirements in entirety, insofar as possible, so that industry has a reasonable and stable target for its R&D on new products for registration. Requiring EPA to conduct any additional tests not specified in the registration guidelines would provide an incentive for EPA to make its decisions (based upon data submitted by the applicant) in a timely and straightforward manner, even though the risks may be somewhat higher.

EXPECTED OBSERVABLE RESULTS

This incentive is expected to reduce the costs and time of the registration process to industry because industry should not have to conduct additional work after the initial submission of data which meets existing, well-established and stable registration requirements. The reputation of EPA will benefit from timely registrations of new products and its increased effectiveness as a decision maker. Indirect results would be less reliance by EPA on additional data in evaluating the risks of the proposed pesticide products, among EPA staff a greater awareness of and experience with the data gathering portion of the pesticide development process, and ultimately, the greater opportunity for industry to use its available research funds in the development of new innovative pesticide products.

EPA Generation of Additional Registration Data, Cont'd

DESCRIPTION AND IMPLEMENTATION

EPA would first review the Section 3 regulations and guidelines and resolve wherever possible any existing uncertainties concerning data requirements for registration. Thereafter, Section 3 and the guidelines would be republished with no changes to be made (except from minor corrections of errors) for two years. Further changes could be made every two years. Definitive data checklists would be developed as an aid to the review of applications. In reviewing future applications for registration, the EPA could still reject data because of its inadequacy or because of errors but only to the extent that the data submitted fail to meet the published requirements. Anytime EPA review staff felt the need for additional, not-previously-specified data, EPA would have to develop the data itself, at USDA or EPA facilities, at universities, state extension services, or independent organizations, under grant or contract. A reasonable time schedule for this data development would be followed, with the industrial applicant kept informed of progress and results as the work proceeded. On the other hand, the industrial applicant could elect to provide the additional required data at his own cost. Any data generated by the government would be in the public domain, not to be used in support of other registration applications without approval of the applicant and compensation to the government.

REQUIREMENTS FOR SUCCESS

The success of this incentive depends primarily on EPA's attitude and view of the registration and review process. Initially the incentive may force EPA to be more cautious in establishing data and test requirements. Ultimately there will be less opportunity or incentive for EPA to require more data. It is important that this incentive not "backfire," i.e., that EPA not make the registration requirements so stringent that the time and costs of registration to industry increase still further, so that EPA may never be required to generate any additional data. Thus this incentive attempts to strike a balance between reasonable requirements for registration, whose costs are paid for by industry, and additional testing to lower the risk involved in registration, with the costs borne by the public. Since it will not be easy to determine in all cases whether additional tests are required because of inadequacy of the initial submission or because of new EPA demands, at best a spirit of cooperativeness will be developed. At the other extreme, an organized process for arbitration could be required to resolve conflicting views of industry and the EPA.

GOVERNMENT FUNDING OF RESEARCH ON FORMULATION AND APPLICATION METHODS

SUMMARY

This incentive addresses the present fragmented industry patterns, which leave the final consumer with the task of integrating pesticides and equipment, and thus impede adoption of new improvements. It would increase significantly the current level of research under the direction of a joint EPA-USDA management committee, assisted by an industry-user advisory committee. Research projects, conducted mainly by state research and extension organizations, would emphasize close cooperation by researchers with consumers, equipment manufacturers, and pesticide formulators.

OBJECTIVES

Better formulations and techniques of application would presumably improve the variety of acceptable pest control methods available to farmers, reduce the economic damages caused by pests, and promote methods that are increasingly non-persistent and non-toxic to non-target organisms.

Moreover, a program sponsored by EPA and successful in assisting farmers and the pest control industry would help to dispel antagonism toward EPA.

EXPECTED OBSERVABLE RESULTS

Benefits of this program would be both direct and indirect. State research stations and extension systems would probably receive the major share of increased funding, although contract research by pesticide formulators and equipment manufacturers would no doubt be useful as well. Both industries might be fearful of changing traditional techniques, but they would also welcome government-paid research that would strengthen the variety of their product lines, reduce the uncertainties and costs of registering new formulations, (and probably move them into the market more quickly), increase their acceptability on environmental grounds, and, facilitate the introduction of new products to farmers.

An example of a current innovation, which the program could help to develop and validate, is encapsulation, the relatively new technique of releasing small amounts of pesticides over long periods of time. Encapsulation offers the potential of using only the amounts of chemical needed to kill the pest, thus avoiding the overdoses of persistent chemicals that characterize many present application techniques.

Government Funding of Research on Formulation and Application Methods, Cont'd

DESCRIPTION AND IMPLEMENTATION

The research funding for pesticide formulation and application would be increased significantly over the next five to ten years. Research would emphasize the integration of improvements in formulation with improvements in application techniques. Although government would probably fund and conduct most of the reasearch, companies might be induced to supplement the effort by absorbing some costs of research contracts in return for strengthening their staff skills and competitive positions. State agricultural research organizations, aided by extension agents, would study and define consumer needs in light of changes in agricultural practices and of pesticide acceptability criteria set by EPA.

A joint EPA-USDA committee would be established to supervise the program to set priorities, to control the allocation of budgeted funds, to monitor progress, and recommend changes in program emphasis to the funding authorities. A broadly-based advisory committee would also be created with representation from the formulators, equipment designers, state-level researchers, and final consumers. This committee would advise on identifying research opportunities, problems, and resources.

Current pesticides and application practices would be surveyed in order to identify, and rank current problems.

These problems would be assigned mainly to state agricultural stations and their affiliated extension systems who would be charged to work closely with the formulators, equipment manufacturers, and consumers. They would develop accurate data on consumer needs, relay them to formulators and designers as inputs to their development of improved pesticides and application equipment, conduct limited tests of proposed improvements, report results to EPA, and verify the accuracy of findings and acceptability of improvements to all parties.

REQUIREMENTS FOR SUCCESS

Significant new funding required for this program would total several million dollars. EPA, USDA, and state agricultural research stations would have to work in close cooperation. Protection of company proprietary information would also have to be ensured. Commercialization of techniques developed under the program would require modified federal policies, allowing licensing of private companies to use government-owned techniques, possibly in return for payment of royalties to the government.

DEFINITION OF STANDARDS FOR "SAFETY"

SUMMARY

This incentive tries to address industry's complaint that EPA's operational concept or definition of "safety" often seems not clear enough for the practical needs of business, and subject to unexpected change or re-definition.

EPA would seek to encourage industry to improve acceptable pest control methods, and both EPA and industry would seek to reduce the costs of developing new pest controls considered "safe." This incentive consists of several steps, mainly more use of ASTM, and ANSI, but also better communication of guidelines to users.

OBJECTIVES

By improving its definition of "safety" and related terms, EPA would seek to encourage industry to develop a more adequate supply and variety of pest control methods and to decrease the human and environmental hazards of pest control agents.

In addition, EPA would hope to establish interpretations of safety.

Industry's interest in this incentive would be perhaps simpler. With its concern for reducing costs and working in a more certain business world, industry would welcome steps to clarify the ground-rules and to stop (or at least slow) the "moving target" of how its products are declared safe for commercial use. The reduction of uncertainties and delays would likely reduce industry's costs for developing and registering new products.

EXPECTED OBSERVABLE RESULTS

Tha nature of the results would probably be less quantitative than judgmental. Successful clarification of key terms such as "safety" should lead to fewer complaints from outside critics resulting in misunderstandings. (However, differences of opinion would certainly continue based on differing values and judgments about what levels of safety are appropriate for public policy. Indeed, one measure of success for this incentive would be that policy questions under debate would be posed more clearly.) Moreover, tools in the forms of better working concepts should lead to fewer sticky registration cases delayed by unexpected policy debates. Therefore, registrations should occur somewhat faster and in greater numbers than is normal today.

DESCRIPTION AND IMPLEMENTATION

The problem addressed by this incentive has already been reported often; moreover, EPA has recently taken steps to improve its ground-rules by issuing its Section 3 regulations (40 FR 28242 of July 3, 1975) and Proposed Guidelines (40 FR 26802 of June 25, 1975). These will no doubt alleviate some problems.

But other steps should also be considered. One would be to make more vigorous and effective use of the voluntary standard-setting mechanisms provided by the American Society for Testing and Materials (ASTM). ASTM's Standing Committee on Pesticides, one of its 125 Standing Committees, offers a ready, established, and continuing forum with time-tested procedures, where various parties-at-interest may meet to exchange views and resolve differences of opinion. Its current chairman, A.J. Culver, Jr., is an EPA staff member from the Corvallis, Oregon, laboratories, and other staff members serve on various subcommittees.

Another step would be participation by top-level EPA representatives in the new Environmental Council now being formed by the American National Standards Institute (ANSI). Whereas, ASTM's Pesticides Committee, composed of about 200 scientists and technologists, concentrates on technical standards relating to test methods, ANSI's Environmental Council, limited to 12-20 policy-making administrators from industry, government, and consumer groups, is being launched to focus needed attention on complementary policy questions relating to regulatory standards. To be effective, the Council should include, as EPA's representative, its Administrator or Deputy Administrator and officials with similar decision-making powers from industry. Although relations between government and industry have been relatively fruitful at the ASTM technical level, these Standing Committees typically are not alerted early enough to the pending need for developing new analytical techniques, thus slowing down the standard-setting process when the need becomes critical. An important policy role of ANSI's Environmental Council, therefore, should be to monitor the progress of ASTM's Standing Committees, to find ways to mesh timing with related federal time tables, and to establish priorities reflecting public regulatory needs.

REQUIREMENTS FOR SUCCESS

Two stand out. First, EPA and OPP need to decide that clearer definitions of their operating concepts and guidelines are necessary for achieving their own goals. Second, they must follow through with determination and consistency, by appointing officials of sufficient status to committees and by providing them with the funds and organizational support needed to represent EPA well.

CLEARINGHOUSE FOR RESEARCH RESULTS

SUMMARY

The government would compensate companies for a fraction of the cost of the research effort involved when they voluntarily contributed results of the research to a clearinghouse, where the information would be accessible to other companies and the public. The information in this clearinghouse would help reduce researchers' duplication of prior work and lead to more productive R&D.

Ultimately more productive R&D would help us achieve the EPA's goals of improved environmental and human safety of pest control agents, develop a variety of pest control methods for important pest problems. and probably increase the effectiveness of pest control methods.

OBJECTIVES

The object of this effort is to make available for public information the results of screening of chemical compounds for various pesticidal uses; in most cases this will be unpromising data, but in every instance the freer interchange of information will make the research efforts of other companies, the government, or universities more productive because less duplication will occur. More productive research should lead to less costly research and/or the development of more innovative compounds. This will help achieve important goals of EPA, i.e., encourage new R&D and the development of an adequate supply and variety of pest control methods. It would be an important contribution to industries' efforts to improve profitability and screening operations. Lastly, to agriculture and other users, it could be expected to accelerate the availability of new pesticides.

EXPECTED OBSERVABLE RESULTS

Observable results would be relatively long term; their impact on research effort would not be apparent for four to six years. However, the benefit would be long lasting, since the knowledge disclosed would be of value for many years, in fact, indefinitely.

DESCRIPTION

Much unsuccessful research is undertaken in the search for new pest control methods. Currently most of that information generated reposes, unutilized, within the records of the research organization that originated it, of limited value to that organization, and no value to researchers in other organizations. If the information were generally available to interested investigators, it could serve at least to prevent other research workers from "rediscovering the wheel," especially ones that don't work, and to provide for other workers a possible clue that would help in the development of an innovative new pest control method or agent.

A clearinghouse for this research information would facilitate its availability and dissemination. Nobody likes to air his failures, and all organizations are apprehensive that the research results may ultimately have some value to their competitors. Therefore, it is unlikely that companies would release this information without some safeguards and incentives to do so.

For these reasons, a financial reimbursement for a fraction of the cost of the research (either as a percentage of the cost through screening or a fixed amount per compound) required to develop the information would be made by the government. This function could be supervised by the Department of Commerce in its National Technical Information Service, by a learned society, or Chemical Abstracts, with the sponsorship and financial support of the EPA or other funding mechanism.

REQUIREMENTS FOR SUCCESS

Implementation would be reasonably simple; the administrative framework is partly in place in the case of the NTIS or the Chemical Abstracts. Funding is presumably within the EPA's control, and costs should be nominal. Once the procedures had been established, the administrative burden would be modest, especially if a fixed fee per compound was set as the incentive payment.

On the other hand, that incentive payment must be sufficient to overcome industries' reluctance to part with the information and to overcome fears that it may be of use to their competitors. A mechanism must be developed for patented compounds or uses, whereby the developer would receive a fair value for the licensing of any compound found to be of commercial value. However, with accceptance of the incentive, the owner must license the compound if such license is sought. If the compound is not patented, it must become public property.

RESEARCH INVESTMENT CREDIT

SUMMARY

This incentive is to encourage companies to invest in pesticide R&D activities. The incentive could be altered by changing the percent tax credit or by defining the type of research that would be eligible for credit.

On EPA's recommendation, Congress would pass a tax abatement scheme similar to the current investment credit, which allows a company to offset directly its tax liability by 10% of the capital investment made in the tax year, providing the total did not exceed 50% of the pretax profits. This incentive would allow companies to offset their income tax by a certain percent (perhaps 10%) of their research expenditures on pesticides during that tax year.

OBJECTIVES

From the point of view of the government, particularly the EPA and USDA, the object of this incentive is to encourage more research on pest control by private industry. Increased research, in turn, can be expected to lead to more innovative means of pest control. Furthermore, the incentive can be designed in such a way by the government that it channels the research effort into whatever direction is of particular interest to the government. Since this is a financial incentive to increase research, the time horizon to initial results is likely to be relatively long, five or more years, but the benefits will accrue for many years, even if or after the incentive is withdrawn.

For the developer of basic pesticide control products or methods, the incentive will reduce research costs, since some is recovered in reduced taxes. This reduced cost leads to a higher return on the money invested in research, development, and marketing of the product resulting from that research. Furthermore, most of the benefits can be claimed via the Internal Revenue System, in a manner similar to the present capital investment tax credit system, with which industry is thoroughly familiar.

EXPECTED OBSERVABLE RESULTS

The government can expect to see an increase in research effort and the resulting development of new products or methods for pest control within about five years. As it costs about $6-8 million to develop each new product and introduce it to the market, the cost in lost revenue to the government will be a fraction of this figure, the exact level depending on the percent of research expenses that can be offset against income tax liabilities. This figure can be set at any level desired, and the incentive will be directly proportional to that level.

Research Investment Credit, Cont'd

DESCRIPTION AND IMPLEMENTATION

The research investment credit incentive is very similar to the current Federal tax credit for investment in depreciable personal property (Internal Revenue Code Sections 46-48 and 50) except that it applies to the costs of research, rather than capital goods. The present law allows individuals, partnerships, and corporations to offset directly against their income tax liability 10% (in most cases) of capital investments (of most kinds) placed in service in that tax year up to $25,000 plus 50% of the tax liability over that amount. Furthermore, it allows that credit to be carried back three years and forward seven years, permitting the credit to be utilized even if there is a loss in one or more years.

Currently, although research facilities are eligible for investment credit, research expenses are not. The research investment credit would work in a manner similar to the capital investment credit, except that it would apply to clearly defined research efforts and the minimum credit and percent levels could be altered upward or downward. For the purpose of this example, they are assumed to remain the same as the present investment credits. The research investment credit incentive could be focused on specific areas of interest to EPA, e.g., biological control, by restricting the type of research (or development) eligible for tax credit.

The implementation of the incentive calls for an Act of Congress to alter the Internal Revenue Code and the development of tax guidelines in that new law. The further implementation then would be through the normal Federal Income Tax Return Statements.

REQUIREMENTS FOR SUCCESS

Obviously the incentive should be substantial enough to be attractive to the recipient; it should more than offset his additional clerical work and the burden of government monitoring (possibly including disclosure of R&D targets) required to be sure he is operating within the tax guidelines. A 10% level should offer such an incentive. Assuming this 10% tax credit and a cost of $6-8 million to develop a new product, the cost in lost tax money to the government should not exceed about $100,000 per year per successful compound, assuming credit was given for the entire expense of developing the pest control compound or method, and a lesser cost if only parts of the expenditures were eligible. An incentive such as this will only be effective, however, if there is a reasonable confidence on the part of industry that this incentive will be available over a fairly long period of time, say at least ten years.

REPAYMENT LOAN FUND FOR PESTICIDE R&D

SUMMARY

This incentive would provide loan funds for industry to conduct long-term toxicity and other required development tests on potential products. Funds provided by the federal government to pesticide development or independent organizations would be repaid if and when commercialization of the products had been achieved. An advisory group and peer review system would oversee the selection of potential products for funding and provide quality assurance.

OBJECTIVES

The process of discovery, development, and registration of new pesticide products is lengthy and expensive, lasting an estimated 5 to 8 years and costing $5 to $10 million per product. Many small companies lack the available capital for the initial investments and cannot maintain such a long-term investment, even for the potential products. Larger organizations facing similar financial constraints must rely upon the profitability of existing products to support new product development.

This incentive provides loan capital to be used for long-term toxicological or environmental testing, which is in the public interest mandated by public regulatory agencies, or for other important steps in the development process. Repayment of loans would depend upon the successful commercialization of the resulting products; provisions would be made to ensure that diligent efforts are expended on new pesticide developments. Pesticide producers may have a means to support their more innovative, but less certain, approaches to pest control. Although the initial expenditures necessary to establish the loan fund might be high, the effort could be self-sustaining if successful products are developed and loans are repaid.

EXPECTED OBSERVABLE RESULTS

This incentive will not yield significant results for at least five years. After this time, several new pesticide products would be registered and marketed each year; products that presumably would have otherwise been unavailable. Another observable result would be the establishment and growth of new pesticide development organizations, as well as renewed interest in pesticides among existing companies. A side benefit of this incentive would be the establishment by industry, agriculture, government, and the public of criteria for desirable pesticides.

DESCRIPTION AND IMPLEMENTATION

This incentive, originally proposed by Djerassi*, was intended to reduce the burden of long-term toxicological testing required by EPA. Djerassi proposed that the developer of a potential pest control agent have the option of applying to the appropriate federal agency for funding of long-term toxicological tests in an independent laboratory. If the product were commercialized, the developer would pay to the government a royalty over the lifetime of the product of until the costs of the original loan (with interest) had been repaid. Djerassi suggested limits to the funding requests and a peer review system to aid in the program implementation.

The incentive proposed herein builds upon Djerassi's concept and offers several other features for consideration.

1. An advisory group consisting of federal pest control and health experts, industry representatives, and the public to develop criteria and a methodology for selection of potential pesticide products to be considered for funding under this incentive and to oversee the implementation of the loan fund.

2. A loan fund of $10 to $20 million, with authorized expenditures for at least a 5-year period to provide for continuity of effort and stability of the incentive.

3. A loan schedule, with limits placed on the funds available for different portions of the development/test process, and a repayment plan (royalty on commercialized product or other scheme).

4. Provision of funds to either an independent organization (not a government entity) or the pesticide company seeking support. Funds provided to an independent group may include a "guarantee" that the data obtained in accordance with approved protocols would be acceptable for registration. Funds provided directly to the developing organization may be subject to constraints such as periodic peer review to prove diligence in pursuing tests, incremental funding based upon results, etc.

5. The proprietary position of the industrial organization requesting funds would not be compromised, except for the royalty provisions made to the government.

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*Djerassi, C., C. Shih-Coleman, and J. Dickman, 1974. Insect control of the future: operational and policy aspects. Science 186:596-607.

REQUIREMENTS FOR SUCCESS

The principal requirements for success of this incentive are the initial establishment of a large enough fund to have an impact on the R&D process and the development of an equitable process for selecting potential products for funding and for loan repayment. The first will most likely require congressional action or a separate funding of FIFRA. The second will need cooperative action of EPA, USDA, HEW and pesticide developers. It might be advisable for pesticide organizations to act through their trade associations in developing this incentive. Since the funding will be optional, companies can participate as they desire depending upon the risks they envision in specific products. An additional requirement for success, however, is the desire of several companies to share with the government the risk of product development at the expense of some of the potential profit.

LOW-INTEREST GOVERNMENT LOANS

SUMMARY

A federal agency such as USDA or the Department of Commerce would offer low-cost, long-term loans to pesticide development organizations to fund specific toxicity and environmental tests required for registration of new products. The developing organizations must demonstrate the efficacy of the product for which a loan is requested, meet a test schedule, and agree to repay the loan over a 10-year time period. The incentive will increase the capital availability for companies and hopefully will increase the flow of new products through the registration process.

OBJECTIVES

Within the pesticide industry, there is general belief that government regulations have caused significant increased in the cost of research and development of pesticides. These costs have resulted in a decrease in the type and number of new pesticide products that enter the marketplace, and ultimately in decrease in increases in the cost of maintaining agricultural productivity. Since a portion of the increased cost of the regulations is caused by increased public concern and action with regard to human safety and environmental quality, the public might reasonably be expected to bear some of these costs. One method is to pay the increased cost of pesticide products, passed on from farmer or other user to the consumer. Another approach is through federal support of the pesticide industry, in part of their work.

The federal government has offered capital in the form of low-interest loans to many groups, including farmers, veterans, industries, municipalities, to assist them in endeavors that they would otherwise not be able to undertake. This incentive would provide similar low-interest, long-term government loans to qualifying pesticide organizations. The loans would be used to finance portions of the R&D program for new pesticide products, e.g., tests required by the registration process, or at the discretion of the company, in meeting other regulatory requirements. The intent of this incentive is to provide low-interest capital to assist in the R&D required by regulations, and allow pesticide companies to use their own capital for the higher risk or enterpreneurial portions of the R&D process: synthesis, screening, production research, etc.

EXPECTED OBSERVABLE RESULTS

The results of this incentive action can be both intermediate and long term. Availability of funds to conduct the testing required by registration will permit some organizations to bring more potential products into the registration process over the next three to five years. If company internal funds are available for the more critical steps in the development process, opportunity for innovation of new pesticide products may also increase over the longer term. Although this incentive does not alleviate the increased cost of registration and regulation, it provides a mechanism whereby organizations can meet corporate goals of appropriate use of capital and achievement of profitability, while at the same time meeting a national need.

DESCRIPTION

An agency of the federal government, most likely the Department of Agriculture (or perhaps the Department of Commerce and the Small Business Administration) would establish a procedure for reviewing applications and granting loans to pesticide companies. Low-interest, long-term loans would be provided to organizations for the conduct of the specific tests required by the registration regulations and guidelines (e.g., long-term toxicology, environmental fate and significance, residue). Efficacy would have to be demonstrated for each product and the results of acute toxicity tests submitted in order to provide sufficient proof that the product is a good candidate for registration.

A schedule of loan funds available for various tests would be developed, with individual companies restricted to some maximum number of loan applications per year. Loan funds would probably be restricted to tests on new products, rather than new applications for already registered products in an attempt to expedite the entrance of new products into the marketplace. Loans might be restricted further to approaches or products that are "innovative" or in a special category such as biological controls. Funding, provided incrementally based on the results of the prescribed tests, would not extend for more than three years for any one product. Repayment would extend for a longer time, perhaps ten years.

REQUIREMENTS FOR SUCCESS

Establishment of this loan program will most likely require Congressional approval and recognition of the problem imposed by current regulations. The major costs to the government will be for administration. Industry would have to agree to a fixed schedule of tests, probably conducted in a prescribed manner. Although the loans would not be large financial benefits since they must be repaid, the availability of funds over a short term may be a significant advantage to some pesticide companies. Careful delineation of tests suitable for the loan program, as well as simple means for demonstration of efficacy and low acute toxicity, will be important in the implementation of the incentive. An agency other than EPA should probably administer the loan system.

PROPRIETARY PROTECTION FOR BIOLOGICAL PEST CONTROL AND IPM

SUMMARY

This incentive would attempt to eliminate a major barrier to extensive industrial R&D of biological control methods by improving the proprietary protection for bacterial, viral, and predator pesticides. The improved protection would result from strengthened and enforced patents for processes, formulations, or applications, "pseudo patents" for special pesticides, or similar changes in the patent system. An alternative mechanism would be granting of EPA by "proprietary registrations" for a specified time in lieu of a patent.

OBJECTIVES

Industry generally acknowledges that the lack of adequate proprietary protection for products is an important disincentive to R&D on new forms of viral or bacterial approaches to pest control. In general, patents cannot be obtained either for new species of bacteria or viruses or for their use in IPM programs, and processing patents usually apply only to a single specific method, among many, of producing the bacterial or viral strain. Without the security of a patent or other protection mechanism, industry is often unwilling to devote the necessary sustained R&D effort to develop and market biological pest control methods (assuming that these methods would meet other goals of efficacy, safety, etc.).

This incentive would establish one or more mechanisms--in the form of "pseudo patents," strengthened peripheral patents, "proprietary rights," or a "proprietary registration"--which would provide a patent-like status for selected biological control methods and/or their use in IPM techniques. As a result, industry could expect a greater return on its investments in biological control R&D and products, and thus might be encouraged to devote more of its efforts in exploring these approaches. EPA would receive the benefits of the availability of a greater range of alternative techniques for pest management.

EXPECTED OBSERVABLE RESULTS

Observable results of this incentive would be long term. If greater proprietary protection were available, major pesticide companies that have devoted only limited efforts to biological control would presumably expand their R&D efforts and reexamine some approaches that have been "on the shelf." The incentive would benefit smaller pesticide companies as well, since product protection could be assured and would represent an investment strategy. In a four- to eight-year period, several new bacterial or viral pesticides could be expected to reach the market. The incentive would be self-sustaining and, combined with creative R&D efforts and other incentives dealing with biological control, could provide a major stimulus to the development of biological controls.

DESCRIPTION AND IMPLEMENTATION

This incentive might be accomplished either through changes in the patent and/or copyright system and /or through changes in the EPA registration process.

The exclusivity and applicability of process patents for bacterial or viral pesticides could be strengthened. For example, patent for a basic fermentation (or other culture approach) process awarded for a typical bacterial pesticide could be sufficiently broad (instead of limited to narrow, controlled conditions) to prohibit other organizations from using the basic process to produce the pesticide. Similarly, broad generic patents could be provided for the formulation process--both ingredients and methods. Methods of storage and/or handling of the agent from its production to end use could also be given strong patent protection. Several of these suggested features might be incorporated in the modification to the patent system currently being considered by Congress.

A second possible approach would be strengthening of the provisions of copyrights and trademarks. For example, a particular biological species might be used as a trademark or the use and application copyrighted. Other companies could not use this designation or instructions (broadly interpreted) in the registration, labeling, or promotion of the product.

Another approach might be "pseudo patents," which would apply to a natural product or bacterial or viral species. The pseudo patent would have the intent and protection offered by a normal patent on a chemical product, but be limited to the use of the product as a pesticide for specific uses. Such a pseudo patent issued at time of registration might apply to use on a specific crop or insect pest. The pseudo patent system could even be used for predator or parasitic species. Any change in the patent system must be accompanied by a speedy and equitable enforcement mechanism.

A second means of providing proprietary status for biological control methods is through the registration process itself. EPA could register a biological control approach after data requirements had been met (in the order in which the applications are received) and provide a protection period of ten years, for example. During this protection period, EPA would not register the same biological control method (e.g., species, culture, or insect) again to another company, except under a license agreement with the company holding the original registration. Since all products have to be registered, the license would serve as patent protection. The 3(c)(1)(D) section of FIFRA amended would not apply to these products. After the specified period had passed, EPA would register the product to all who applied with appropriate data.

REQUIREMENTS FOR SUCCESS

This incentive would require the approval and enthusiasm not only of those who administer the patent system but most likely, also of Congress. Success would also depend upon appropriate definitions, limits, or standards for biological control approaches, so that the eligibility of each product for this protection could be determined easily. Since biological products are used in other industries, the process envisioned here may have to be expanded to areas other than pesticides.

For EPA, FIFRA will probably have to be changed allowing "special consideration" to be given to biological approaches and careful guidelines provided. Whether or not the EPA can grant the "exclusive" registration, probably will have to be determined by Congress or the courts. Another most important requirement for success of this incentive is the acceptance by EPA, industry, agriculture, and the public that biological control warrants such special consideration.

COMMERCIALIZATION OF PESTICIDE PRODUCTS DEVELOPED BY OR FOR THE GOVERNMENT

SUMMARY

Federal agencies would encourage industry to exploit pesticide technology that had been developed by or under contract to the government. Two means of this encouragement would be exclusive licenses to government-owned patents and facility-development contracts for the pilot production of novel pesticides.

The program would emphasize biological control methods.

OBJECTIVES

The primary objective of this incentive is increased commercialization and utilization of innovations developed at government expense, USDA or EPA would obtain the societal benefits presumed to result from the exploitation of innovative technology. Since the basic and applied research being conducted at government expense is already directed toward meeting such goals (as individually stated by these agencies), the exploitation of the discoveries resulting from such a program should also be in the interest of the agency and of the government. Previously the development of novel technology by such agencies was believed to be followed by the rapid absorption of such technology by the private sector. This, however, has not always been the case. By the development of specific programs for such exploitation, the benefits initially expected could, in fact, be realized.

The companies receiving the licenses and contracts would have an opportunity to develop new products with a decreased investment and risk. The facilities-development contracts would allow companies to "learn" and test new production methods, especially in the area of biological control. Such work could be conducted by both large and small companies without the risks normally associated with entering into a new product area. The licenses would allow companies exclusive rights to technologies and products without the need for initial internal R&D activities. While the benefits to industrial organizations of acquiring pre-existing technology is oftentimes not especially economically significant (in light of the pre-registration testing that is still required), the fact that the royalties for such technology would be drawn from profits acts as an additional stimulus to exploit such technology.

EXPECTED OBSERVABLE RESULTS

With a reasonable level of support, this incentive should produce at least ten exclusive licenses per year and half as many facilities-development contracts for biological control products.

Commercialization of Pesticide Products
Developed by or for the Government, Cont'd

DESCRIPTION

The USDA, EPA and other agencies would take specific steps to encourage the utilization of pesticide products and technology developed and owned by the government. Specific attention would be directed to biological control developments, in which the work at government expense had not resulted in a viable commercial pesticide product although the potential for successful commercialization existed.

The specific encouragement would be twofold. Industrial organizations would be provided, exclusive long-term licenses to government inventions. Such licenses would last as long as the patent. The industrial organization receiving the license would be the one demonstrating the production and distribution facilities most likely to allow the exploitation of the technology. The specific royalty arrangement would be based on profits rather than on sales so as to further encourage development.

The second means for encouraging utilization of government-developed pesticide technology would be through the specific use of facilities-development contracts. Government agencies would recognize as part of their task in performing basic and applied research in pesticides the goal of producing enough materials for satisfactory testing of efficacy. The production of such materials (including biological control agents) would be contracted to industrial organizations with the understanding that such organizations would then be prime candidates for receiving future license to the technology (since they would have acquired the requisite production experience).

REQUIREMENTS FOR SUCCESS

The success of this incentive would depend upon the existance of significant product ideas from government research suitable for commercial exploitation. Interviews at the ARS indicate that such undeveloped "inventions" do exist. Furthermore, industry and government would have to perceive the same product ideas as commercially attractive.

AGGREGATION OF PUBLIC SECTOR MARKET DEMAND

SUMMARY

This incentive, to aggregate public sector market demand (at the federal level at least, and possibly the state and local government levels as well), is intended to apply the forces of market demand to encourage innovative pest control products. This mode has already begun to be explored by the General Services Administration for other civilian goods and commodities.

OBJECTIVES

The primary objective of this incentive is to encourage development of more effective pest control methods.

For the commercial pesticide producers it would reduce the risks in introducing new pest control method(s) by assured, near- and long-term, market demand of sufficient volume and similarity of performance requirements to warrant investment in product development.

EPA's objective would be to stimulate aggregation of federal and/or state-local purchasing to performance requirements agreed upon between EPA and purchasers, in order to stimulate commercialization of desired pest control method(s), by using aggregated public market demand as pump-priming for potential private market demand.

EXPECTED OBSERVABLE RESULTS

Within two to three years, continuous improvements in pesticide control methods would be expected such that public market needs are satisfied (e.g., Forest Service) and potentially desirable methods are provided for the private market as well. A longer term result (five to seven years) could be requiring a large enough market to provide opportunities for high-volume production, and/or with a cost-differential (over existing methods) that must initially be borne by public sector.

These near- and long-term results would benefit both private and public sectors, by providing improved and highly innovative pest control methods that might otherwise be unavailable.

DESCRIPTION AND IMPLEMENTATION

Aggregation of public sector demands for improved or new pest control methods is intended to exert the pull of market demand on industry to provide such methods. Federal, state, and local government markets appear to be large enough to exert this effect if appropriately aggregated. EPA would persuade GSA to become the lead agency in developing federal agency-wide purchasing practices to common performance requirements.

Aggregation of Public Sector Market Demand, Cont'd

Agreement on performance requirements (efficacy, toxicity, environmental safety and health as well as price) would have to be achieved among numerous agencies [DOD, USDA, USDI, HEW, USDL (OSHA) and CPSC]. GSA (for all of the civilian "consumer" agencies) and DOD would have to collaborate to articulate prospective size of combined government market and continuity of such market with stated performance specifications over 5-10 years (in order for industry to obtain desired return on investment), and test industry reaction in order to determine if "stimulus" would work.

If this proves to be successful at the federal level, state agencies should be encouraged (voluntarily or not) to join the "purchasing pool."

In setting performance requirements, federal purchasing agencies must bear in mind prospective costs and risks of developing new pesticide control methods implied by these requirements. This calls for frank and open discussion between buyers and sellers. Also, discussions are needed between government buyers and prospective civilian purchasers to determine whether and how performance requirements satisfying government needs do, or can be made to, meet prospective private user needs also.

REQUIREMENTS FOR SUCCESS

Technological innovation is most likely to be productive and viable over both the short and the long term if a deliverate kind of continuing creative tension is maintained between two different approaches to innovation: increasing "technology push" and increasing "market pull." EPA's options for action should, therefore, reflect the need to orchestrate the creative tension between these push and pull modes.

EPA can influence the "pull" for innovative pest control in two major ways: by mandating and enforcing increasingly stringent standards for safety; and by helping to create the demand through aggregating public sector markets.

The two actions are not contradictory or mutually exclusive. The second can indeed help to demonstrate the validity of standards set in the first. In fact, it is intended that the "performance" (rather than the design, compound, or method of application) of the desired method be specified (quantitatively) for a variety of criteria: e.g., efficacy of pest reduction, toxicity, safety, environmental and social effects, cost, impact on industry, etc.

EXPANSION OF THE NUMBER AND ROLE OF INDEPENDENT PEST MANAGEMENT CONSULTANTS

SUMMARY

The USDA or EPA would support through training and subsidies an increase in the number (and distribution) of independent pest management consultants who provide advice to farmers and growers. Similarly the USDA would support the development of total performance pest management service organizations in order to aid the farmer and influence pest management practices.

OBJECTIVES

It has been demonstrated that effective use of IPM approaches has the potential for reduction of the environmental hazards of pesticides and for maintenance or improvemnt of agricultural productivity. In the western United States, there has been a growing use of independent pest management consultants who offer advice to farmers and growers for a fee. The advice frequently includes IPM counseling, aids the user in selecting the optimum types and timing of pest control approaches, and can result in substantial savings to the farmer or grower. The objectives of this incentive are to encourage the increased use of independent pest management consultants in other locations and to expand their operations to include a total pest management performance instead of only pest management consulting. The pest management performance organization would select, apply, and monitor, pest control techniques and guarantee a level of pest control to the farmer or grower.

EXPECTED OBSERVABLE RESULTS

In the short term, this incentive will lead to a greater number of independent pest management consultants working in several parts of the country. Their efforts can lead to increased use of IPM, acceptance of IPM by farmers, and reduction in the quantity of pesticides which enter the environment. Expanding the role of the independent pest management consultant can lead to a "centralization" of environmental accountability because a smaller number of persons will be responsible for the use of pesticides. Agriculture will benefit from less costly pest control and lower risks for farmers or growers. Unfortunately there are few, if any benefits to the pesticide industry other than the potential ease of marketing for dealer or distributors. A hoped for result will be the development by industry of pesticides that are more easily integrated into IPM approaches.

DESCRIPTION AND IMPLEMENTATION

The first part of this incentive can be accomplished in several ways. Training programs for independent pest management consultants can be supported by USDA or EPA through the state universities. Existing pest management consultants can be encouraged to add staff and expand their activities by direct subsidy, low-cost loans or other measures. Subsidies should be based upon both staffing and acreage covered to assure that quality is not compromised.

Expansion of the Number and Role of Independent
Pest Management Consultants, Cont'd

Finally, farmers or growers could be subsidized for using the pest management consultants. The subsidies and training would best be funded by USDA or EPA and administered through the states, to ensure that local needs are met and use of the consultants is justified and appropriate.

The second part of this incentive is more speculative in both method and expected results. The federal government, perhaps through the Small Business Administration or the USDA, would assist individuals desiring to enter the total pest control performance business. This could be accomplished through loans to provide initial working capital for equipment and salaries. An insurance program would be considered to reduce early financial difficulties resulting from crop failure when the organizations are not well established, or alternatively an insurance program established for the farmers who use the pest control performance business. In return for this support, the pest control performance organization would be required to utilize IPM approaches, pesticides which are most safe and effective, etc.

REQUIREMENTS FOR SUCCESS

The greatest requirement for success is the acceptance of the farmer or grower of these approaches. Provision of education and information on pest management consultants through the state extension services could help. The pest management consultant has been successful partly because he provides advice and lets the farmer or grower choose methods or pesticides to be used. If the consultant were to enter the "performance" business, he would be considered "another vendor" and make the customer (farmer) suspicious of his objectivity and adequacy. The role of the pesticide industry and its relationship to the consultant or the performance organization is uncertain; industry is not likely to benefit greatly from either and not support them.

PESTICIDE DEVELOPMENT AWARD

SUMMARY

The incentive would be an award, granted each year by EPA for an outstanding achievement in the development of innovative pest control methods.

OBJECTIVE

This incentive would represent an affirmative, rather than punitive, action by EPA. At the present time EPA is viewed as a regulator, enforcer, or at best a protector of the environment. EPA is not seen as an agency that encourages and supports by the use of positive sympathetic and friendly means. Therefore, creation of an award or prize for significant efforts on behalf of the development of innovative pesticides would be a very positive reinforcement for good achievements in the pesticide area.

In the short term, it is unlikely that this would have much direct impact. In the long term, it could have significant impact on the public image of the agency, as well as the view of industrial people who are trying to work with it. Thus, rather than only a negative image of EPA, one would be forced to admit that at least they are trying to be positive and that a participant in pesticide development receives positive benefits.

EXPECTED OBSERVABLE RESULTS

The results sought are likely to be non-measurable because only attitude and image are involved. Conceivably, someone's behavior might change in the basic research area, a new pesticide would be developed, and 10 years from now the person would credit their behavior change to EPA. However, in the next 5 years at least the EPA will not have the benefit of such a blessing. Therefore, the results, at most, will be in terms of image and public relations. It is difficult to visualize negative results from the issuance of an award or prize other than the likely possibility that some people will say that that's a waste of EPA efforts and inappropriate for a regulatory agency.

DESCRIPTION AND IMPLEMENTATION

In order to have any impact the award would have to be significant. Therefore, the award should be the equivalent of: a $100,000 prize; a six-month grant for a university sabbatical with full salary graduate students; a two-month leave of absence from one's employ at full salary; or a year's sabbatical in government service. The mechanics for the institution of such an award should include a blue ribbon panel of judges dominated numerically by EPA staff members (but including others as well), clear mechanisms and requirements for winning the award, and a nominating or canvassing committee in order to get awards up to the judges panel.

REQUIREMENTS FOR SUCCESS

EPA should seek to reward achievements of the very highest caliber. The only requirement for success is that it be done in a way that recognizes these outstanding efforts in a public manner. Although such an award is not likely to motivate large companies, it could motivate university professors, individuals, or smaller groups to spend their efforts doing further research in the pesticide area.

APPENDIX H

INDUSTRIAL, GOVERNMENT, AND ASSOCIATION CONTACTS IN THIS PROGRAM

Industrial Participants

Abbott Laboratories
Amchem Products, Inc.
Chemagro
Chevron Chemical Company
Ciba-Geigy Corporation
Dow Chemical U.S.A.
E. I. duPont de Nemours and Company
Elanco Products Company
FMC Corporation
*Helena Chemical Company
McLaughlin Gormley King (MGK)
3M Company
Monsanto Agricultural Products Company
S. B. Penick and Company
Shell Chemical Company
Stauffer Chemical Company
Story Chemical Company - Farchan Division
Thomson-Hayward Chemical Company
Zoecon Corporation

Government Agencies and Associations Contacted

- EPA
    - Office of Pesticide Programs
        - Criteria and Evaluation Division
        - Ecological Effects Branch
        - Operations Division
        - Registration Division
        - *Special Projects
        - Strategic Studies
        - Technical Services
    - *Office of Enforcement
    - Office of General Counsel
    - Office of Planning and Evaluation
    - Office of Research and Development
    - Agricultural Assistant to EPA Administrator

- USDA
    - Assistant to Administrator
    - Cooperative Extension Service
    - Cooperative State Research Service
    - Economic Research Service
    - *Inter-Regional Project Office (IR-4)
    - Pesticide Coordinator

INDUSTRIAL, GOVERNMENT, AND ASSOCIATION CONTACTS IN THIS PROGRAM

Other Agencies and Associations

American Farm Bureau Federation
Department of Commerce - Office of Environmental Economics
Environmental Defense Fund
Federal Working Group on Pest Management
General Services Administration
National Agricultural Chemicals Association
Sierra Club
U. S. House of Representatives - Committee on Agriculture
U. S. Senate - Agricultural Committee

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* These organizations were contacted but did not receive copies of the Interim Working Document

APPENDIX I

LIST OF COMMENTS ON PROPOSED INCENTIVES (BY INCENTIVE CATEGORY)

Summary comments on the various categories of the 64 preliminary incentives circulated to industry, government and associations in the Interim Working Document are given in the following pages. Not all those receiving the document commented on the incentives by category. EPA-Other refers to divisions or branches of EPA other than the Office of Pesticide Programs.

CATEGORY: INSURANCE/LIABILITY

Industry:

- The federal bureaucracy should not be involved in insurance because:
    1) The potential for gross misuse in the form of false claims of government funds is high.
    2) Such involvement rewards and stimulates poor performance by industry.
    3) Liability is a "proper risk of doing business."
    4) Large companies would not consider this as an incentive because they are assumed costs of business.
    5) Any service, such as insurance, which is available in the private sector should not be duplicated by government.
- These are incentives to the insurance companies, not the pesticide companies.

Associations:

- Federal involvement in insurance would encourage poor quality products in the private sector.
- Federal sponsorship of a reinsurance program for the insurance industry in the area of minor crop pesticides may be a feasible incentive.

EPA-OPP:

- All insurance incentives imply registration of not very safe, not very effective pesticides.

EPA-Other:

- There is potential for insurance incentives; they should be investigated further. The approach should include replacement of "chemical insurance" with "dollar insurance," thus reducing the amounts of pesticides needed.

Other Government:

- Insurance incentives undesirable because of (1) prospective high expenditure of public funds; (2) encouragement of poor performance by industry.

CATEGORY: IR-4

Industry:

- IR-4 is a very useful program run by knowledgeable people. More, similar services are needed and can best be accomplished by expansion of IR-4 rather than initiation of a new program.

- IR-4 is a good program and can remain so as long as it is funded through USDA, not EPA. Government support of minor crops is needed, because industry will not do so. However, a better vehicle for such support would be the trade associations for particular crops; the government could provide funding through the associations.

Associations:

- IR-4 funding should be increased, but should remain through USDA, not EPA.

- IR-4 funding should not be used to direct the program more heavily toward biological controls. IR-4 should remain free to direct its efforts to those control methods it deems most appropriate.

EPA:

- The IR-4 program needs to be extended, as it is unable to keep up with current needs. Grower groups could aid this situation through some mechanism where they can influence the program or directly influence the registration of pesticides.

- Consideration should be given to a USDA-EPA agreement which would allow USDA to register minor crop pesticides.

CATEGORY: INTEGRATED PEST MANAGEMENT--BIOLOGICAL CONTROL

Industry:

- The federal government should not promote either IPM or biological control as their effectiveness has not been proven.

- Promotion of these methods at this time is not justified because:

  1) The prospect of further improvement in IPM is questionable.

  2) Biological controls are not necessarily safer than chemicals.

  3) Non-chemical controls likely are not viable or a possibility for the near future.

- IPM is currently promoted by EPA with the implication that no chemicals are involved. All useful IPM programs use chemicals and should be advertised as such. IPM promoted from EPA will never work; development and support of effective programs must come from the users and extension service.

- IPM likely will not reduce pesticide usage; pesticides are part of successful IPM programs, and such programs will not be so widespread as to have a significant effect on amount of pesticides used. Indeed, farmers are businessmen who would use as little pesticides as possible for economic reasons.

- Current IPM program development should include review of non-chemical pest control methods used prior to 1945 when the shift to chemical methods occurred. New IPM programs should include a balance of chemical and non-chemical methods. Also, IPM methods should encompass all pests and weeds, not just those above some economic threshold.

- IPM is a desirable goal, and incentives which move companies in that direction would be good. Properly directed IPM programs will focus on specific pests without damaging non-target species.

EPA-Other:

- IPM should be promoted through demonstration and user education. Farmers will use IPM if its effectiveness has been demonstrated to them. Beyond this, incentives will have little effect on growth of IPM programs.

CATEGORY: PRODUCT PROTECTION/PROPRIETARY POSITION

Industry:

- Favorable patent reform would allow a greater amount of time.
- Unfavorable; implementation would be difficult.
- Unfavorable, opposed to special treatment for IPM or biological.

EPA:

- Not important, market changes sufficiently fast to reduce significance of patents.
- Favorable, can be incentive to R&D. However, technical and administrative difficulties seem insurmountable.
- Should be examined to fully evaluate feasibility and practicality.

Other Government Agencies:

- Feasibility of approaches other than patent extension is doubtful; patent extension unlikely for pesticides alone.
- Uncertain of the real role of proprietary protection in pesticide R&D.
- Of benefit to large companies only, not favorable.

CATEGORY: REGISTRATION CHANGES

Industry:

- Favorable because:

    1) The administrator has arbitrary powers; there is a lack of objectivity in decisionmaking and a lack of procedural due process.

    2) Input from outside EPA is required on many decisions and should be employed more.

    3) EPA responsiveness needs improvement; EPA responses need to occur more quickly and with a sense of timeliness relevant to seasonality of crops. Stepwise approval on segments of data submitted with definite time intervals and deadlines for segment approval would be helpful, as well as a general time limit for response from EPA.

    4) EPA spends too much time on efficacy, which is time consuming. Some of this time could be diverted to safety which might reduce registration time.

Associations:

- This type of incentive shows the greatest promise. However, certain suggested incentives contain problems, such as excessive reduction of requirements for some products and not others.

EPA-OPP:

- Favorable; increased efficiency in the registration process is desirability.

CATEGORY: TESTING BY GOVERNMENT

Industry:

- There is no need for federal government to do any more that it is currently doing through the state extension services.
- Industry can perform testing more efficiently and less expensively.
- Regarding basic information like toxicity and efficacy

  1) companies would fear loss of proprietary data, and
  2) government funds would be wasted because only marginal compounds would be tested.

- Would not be an incentive to industry, as there would be major problems with lack of control over research strategy and quality and delays (as frequently experienced when industry contracts with research organizations).

Environmental Associations:

- Government should not develop its own data because it would tend to be defensive during evaluation of registration data.

Farm Associations:

- Favorable because the great bulk of additional registration requirements stem from environmental testing which is seen as "in the public interest." Reflecting these costs in EPA's budget would be a means to find out how much "safety" the public is willing to pay for.

EPA-Other:

Very unfavorable; no reasons given.

CATEGORY: GOVERNMENT-SPONSORED R&D

Industry:

- Unfavorable because:

  1) The federal government should not support any R&D that can't stand on its own in the pesticide industry.
  2) This should not happen under any conditions, as government research is inefficient. These incentives would lead to poor quality research, loss of research strategy by industry, and uncertainties due to lack of control over quality and delivery.

- This would be feasible only if the government gave exclusive rights to a limited number of companies.

Farm Associations:

- Unfavorable because:

  1) Private industry has been and continues to be responsive to market demand. EPA feels no such responsibility to the public and as such would not be able to direct research efforts in directions most beneficial to users.
  2) The R&D mechanisms and facilities are in place in private industry and the generation of duplicate facilities by EPA would be a terrible waste of funds. Furthermore, neither the user nor the public would have great confidence in the research abilities of EPA.

Environmental Associations:

Favorable; government sponsorship of R&D is essential. Standards for safety and quality control for testing should be more specific and of high quality. These incentives would insure such measures.

CATEGORY: EDUCATION, TRAINING, AND INFORMATION

Industry:

- These incentives would take a long time to be effective.
- There are no objections to training of farmers, but the mechanism for doing so is unclear. Additionally, it may not be necessary as farmers currently get good instructions from extension services and agricultural field technical service personnel.
- EPA should be involved only to the extent of providing money. The training should be done by USDA through universities and the extension service.

EPA-OPP:

- These incentives are good in general, but as stated are too broad and have been prepared without much knowledge of what the Operations Division has been doing already. The main function of the Division is to tell people how to use pesticides safely and how to protect the environment.

CATEGORY: FUNDING AND REIMBURSEMENT OF INDUSTRIAL DEVELOPMENT

Industry:

- Unfavorable; approach not consistent with free enterprise system.
- Unfavorable both in principle and for reasons of effectiveness; government funding "inevitably" leads to government control of research.

EPA-Other:

- Favorable to subsidies if they control research and lead to more desirable products. A direct, controlled subsidy is preferable to both repayment loans and investment credit, both of which can be operationally confusing.

CATEGORY: PENALTIES

Industry:

- Unfavorable; tax incentives should not be employed.
- Favorable, if implemented slowly and gradually.
- Unfavorable; pesticide manufacturers do not have sufficient control over what happens to their products to require them to pay for various forms of misuse, etc.
- Unfavorable, as industry already faces daily penalties inherent to doing business--lawsuits, assessment of liability damages and resulting loss of business.
- Unfavorable because they would require new legislation.

Farm Associations:

- Unfavorable because of the negative approach.

EPA-OPP:

- Unfavorable; cancellation would have a more noticeable and immediate effect. Further, unsafe products should not be registered. Assessment of equitable penalties would be extremely difficult.
- Unfavorable; difficult to assess tax and administer.

EPA-Others:

- Unfavorable; no reasons given.

CATEGORY: MARKET STIMULATION/PRODUCT DEMAND

Industry:

- Interesting but largely impractical.
- Unfavorable; no reasons given.
- Favorable; no reasons given.

Farm Associations:

- Favorable; aggregation of public sector market demand would exert considerable pressure on various pesticide control markets. However, public sector demand may already consider factors addressed in this section; hence little change might results.

APPENDIX J

COMMENTS ON PRELIMINARY PROPOSED INCENTIVES

Comments on the incentives presented in the Interim Working Document are summarized below on an incentive-by-incentive basis. EPA-Other refers to divisions or branches of EPA other than OPP. Additionally, selected ADL-ETIP-EPA project staff comments are included in order to provide a more complete response to the proposed incentives.

1. Insurance for Minor Crops

In order to encourage pesticide companies to develop and register products for minor crops, the federal government create an insurance program to reduce the company's liability for production-related damage to these low total volume, often high value crops.

Goals: Encourage pesticide companies to register and produce products for minor crops.

Action Agent: EPA, other federal agency

Industry:

- A feasible incentive.
- Insurance coverage should only be sufficient to provide some reasonable return of the investment.
- Liability isn't a problem; liability is a proper risk of business.
- Not really an incentive, because companies still will not spend sufficient money to obtain registration for low volume uses.
- Impractical; likely to encourage false claims.

EPA-OPP:

- Would benefit manufacturers, farmer/users.
- Worthy of future study.
- Program may be cost prohibitive due to administration of claims.
- Production-related liability is not a problem.

EPA-Other:

- Implementation would be too complex and expensive.

ETIP:

- This form of insurance is undesirable because as the incentive is written it includes third party coverage.

Other Government Agencies:

- Favorable, if production-related liability is a problem.

ADL Project Staff:

- It is not clear whether insurance is a major factor in the lack of registrations for minor crops. Implementation of a federal insurance program would be difficult.

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2. Government Insurance for Farmers Using Improved Pest Control Methods

Through a new USDA insurance program, reimburse farmers for crop losses resulting from use of innovative pesticides, formulations, or application methods.

Goals: 1) Provide the farmer necessary security to try a new product.
2) Reduce liability for companies producing innovative products.

Action Agent: USDA

Industry:

- A feasible incentive.
- A good concept is inherent in this incentive, that is awarding of government bonuses to persons using certain methods.
- Difficult to implement and administer.
- Difficult to verify cause of losses; hence, false claims could be encouraged.
- Not an incentive; farmers are willing to try new products on their own.

EPA-OPP:

- Favorable, but large cash reserves and funding would be required for training, paperwork, claims adjustors, etc.
- A strong incentive for users due to its fail-safe nature.
- Could be incorporated into the Federal Crop Insurance Program.
- Favorable, because USDA programs exist as implementation mechanisms.
- Program could be costly, as innovative pesticides are not always safe.
- Could have administrative problems with claims.
- Not a sufficient incentive for farmers to use a new pesticide.

ETIP:

- Favorable because it works on demand.
- Difficult to implement due to problems related to determining cause of losses.

Other Government Agencies:

- An attractive incentive because it properly emphasizes the farmer/user; however, the large cash reserve required means it likely is not feasible.
- Program should be structured to encourage innovation of useful pesticides for problem areas, not just innovation for its own sake.

ADL Project Staff:

- Such a program could induce farmers to take risks they would not otherwise take; however, implementation could be difficult as neither resources nor mechanisms are available.

3. No-Fault Tolerance

USDA and State Experiment Stations would develop "guaranteed" residue and phytotoxicity data which could be used for registration by interested industrial organizations. Companies would not be liable for any crop losses for a specified period after registration if these data were used.

Goals: To encourage pesticide companies to register innovative formulations or products with safer application methods.

Action Agent: USDA, State Experiment Stations

Industry:

- Favorable, but it is doubtful that USDA and State Experiment Station personnel would want to assume risks involved.
- Most useful incentive of all, provided government insurance for unsuccessful product efforts be administered so as to protect the proprietary data and interests of the company.
- USDA and State Experiment Station data is frequently "poorer" than that developed by private companies; their data flow is very slow.
- A disadvantage is that such data would be non-proprietary.

EPA-OPP:

- Incentive value high; would reduce testing costs.
- Difficulty in determining cause of loss (could be from misuse).
- Wrong emphasis; subsidizes the producer.
- Could lead to dangerous residues in food supplies.
- Would be difficult to implement; legal problems.

ETIP:

- Reinforces carelessness in development process.

ADL Project Staff:

- Improper role for Federal government; private industry should develop tolerance data to protect itself.
- Difficult to implement; will not affect research on innovative pesticides.

4. Insurance for Unsuccessful Product Development

To encourage the development of more pesticide products, the Federal government would provide insurance to companies to reimburse development costs of new products of proven efficacy if they are found to be unacceptable during the environmental and safety test and evaluation.

Goals: Encourage pesticide companies to carry innovative product development further than they would normally.

Action Agent: EPA

Industry:

- A good idea; would be supported by industry.
- Favorable, provided the mechanism retains the proprietary interests of the companies.
- Not an incentive--would not increase the number of new pesticides; will not make any difference since companies will pursue products as long as they are effective.
- Difficult to implement.

EPA-OPP:

- This incentive has merit if the minimal amount of environmental and safety data required to get the insurance is defined. Also the amount of data provided on these factors (beyond efficacy data) would have to be sufficient to predict some favorable probability of success.
- Would reduce the risks of product development.
- Would require close monitoring of producers' activities in order to define point at which development and evaluation should be stopped.
- Such a concept would be better implemented through use of tax write-off incentives.
- Would be very costly; difficult to implement.

EPA-Other:

- The general idea is satisfactory, but it does not address the problem of reduced use of pesticides.

ETIP:

- Federal government should not insure failure of private enterprise.

Other Government Agencies:

- Federal role should never insure risks of private sector in doing business; this is contradictory to the free enterprise system.

ADL Project Staff:

- Encourages ineptness and inefficiency and poor decision-making; companies will pursue research on any products they see are promising. Not an appropriate role for federal government.

5. Product Failure Insurance

The Federal government would participate in a program to provide insurance to protect companies against losses due to product failures or product-related accidents. Insurance would not be restricted to minor crops.

Goals: Encourage pesticide companies to register and produce products in general.

Action agent: EPA

Industry:

- Feasible from industry perspective; may not be feasible from government perspective.
- Although liability a problem, government should not be involved in insurance.

Farm Associations:

- Undesirable as it would negate the current competitive effort to produce and market quality products. Additionally, reputable companies have too much at stake to market non-safe, ineffective products; hence, would not use the incentive.

EPA-OPP:

- Should be combined with Incentive number 1; payment of claims may be cost prohibitive; organization and administration of program may be complicated.
- Insuring efficacy not a proper role for EPA; could encourage less careful efficacy and safety testing.
- Not an incentive because production-related costs are assumed as part of operating expenses by industry.

EPA-Other:

- This incentive will not reduce pesticide use.

ADL Project Staff:

- Federal role should not include insurance of the private sector. If the government's desire is to foster the development of quality products, it should do so by positive actions, not by protection against failures.

6. Reinsurance

To provide better insurance coverage for pesticide companies, a Federal reinsurance program for catastrophic losses would be established.

Goals: To allow pesticide companies more freedom to develop products due to increased availability of adequate insurance.

Action Agent: EPA or other Federal Agency

Industry:

- Feasible, but Federal role should not include involvement in insurance; further, government involvement would add overhead to current reinsurance system.
- Catastrophic losses are not a big problem.

EPA-OPP:

- Favorable, but needs further evaluation.
- Payment of claims may be cost prohibitive; organization and administration may be difficult and complex.
- May not be an incentive, as liability may not be a major factor in research and development decisions and directions.
- Implies an expectation of catastrophic losses and hence, acceptance of them.

EPA-Other:

- Not feasible to implement. The logical administrative mechanism is the existing Federal Crop Insurance Program, but cost and time required for such integration would be prohibitive.

Other Government Agencies:

- Should be considered as part of a comprehensive insurance program including incentives 1, 2 and 3.

ADL Project Staff:

- Should be explored further. It could be helpful in promoting wide-scale testing of some innovative pesticides which are not being adequately tested. Similar approaches have been used by the Federal government in other areas.

7. Supplemental Funding for IR-4

Fund, through EPA, additional residue testing of chemicals and biological controls through the IR-4 program.

Goals: Provide coverage for minor crops; encourage development of safer chemicals and biological controls.

Action Agent: EPA, USDA

Industry:

- Not feasible or desirable. This would give EPA even more power than it has now; EPA does not understand pesticide economics.
- IR-4 should receive increased funds but funding should occur through USDA, not EPA.
- Emphasis on biological controls and integrated pest management is already excessive and should not be increased.
- Additional testing will be useful only if done at an early stage in development of a pesticide taking into account seasonality. Such testing could help in getting a new product or idea on the market.
- A favorable idea, especially since the major limitation on minor crops is market potential and return on investment. However, coordination with IR-4 needs improvement; IR-4 sometimes does not get enough data and companies must provide more. Companies should be able to go to IR-4 with, and initiate tests on, specific products rather than IR-4 come to companies with requests for registration.

EPA-OPP:

- Worthy of further study; this could be a good cooperative arrangement with no great risk or expenditure of funds.
- IR-4 funding should be increased, but through USDA, not EPA.
- An incentive for industry as it reduces development costs.

Other Government Agencies:

- A favorable incentive because of its emphasis on minor crops.
- IR-4 funding should be increased; however, there is some doubt if it will use the funds effectively.
- The incentive could be unmanageable for several reasons: safeguards would be needed to limit the amount of testing done, the number of compounds tested, the number of compounds per submitter. Additionally, the program could be used to test questionable compounds about which a great deal was already known; hence a "free ride" for users.

8. Residue Journal

As part of IR-4, establish a journal to publish residue research in order to recognize scientific work of an important but not glamorous type.

Goals: To increase the number of products registered for minor crops by encouraging residue studies by researcher.

Action Agent: USDA, other agency

Industry:

- Favorable, but not feasible unless EPA accepts the research without criticism.
- Favorable, but journal should include efficacy as well as residue data.
- Not useful, but if adopted government should maximize use of its dollars and have private industry do work rather than universities or other institutions.
- Harmless, but useless. Not an incentive; unimportant.

Associations:

- Favorable; would encourage more residue work.

EPA-OPP:

- Not useful; too many similar journals already.
- Favorable, but has questionable incentive value.
- Favorable, but implementation should occur through expansion of present journals combined with increased communication of its value to users.

Other Government Agencies:

- Unfavorable; no reason for government to sponsor such a journal.

ADL Project Staff:

- This is not an area for EPA or USDA to be involved with, but rather is more appropriate for industry or technical, professional groups. Such a government-sponsored journal likely would be of mediocre quality, and thus not be respected. Hence, incentive value would be low as the opportunity for a government or industry researcher to publish in such a journal would not be very attractive.

9. Crop Groupings for Minor Crops

By means of crop groupings, enable registration of one product for several minor crops on the basis of one set of tests.

Goals: 1) Improve the efficiency of IR-4.
2) Provide more products for minor crops.

Action Agent: EPA, IR-4

Industry:

- Favorable because:
  1) it would reduce the workload on small volume pesticide clearance; also reduce required time and fees for registration;
  2) system was once operable which was effective; more recently a new, feasible system has been developed which could be adopted;
  3) is feasible as demonstrated by registration of Enstar on a variety of ornamentals;
  4) the minor crop market could become a major crop market, thus providing an incentive to industry for more research.
- Could be effectively combined with Incentive number 3 - No Fault Tolerance.
- Marginally helpful, if administered properly and in conjunction with a reasonable and consistent registration and regulatory attitude.
- Groupings useful, but company would not market products it had not tested itself.

EPA-OPP:

- Favorable, because:
  1) would accelerate registration process;
  2) is a definite incentive for minor crop research;
  3) is not costly;
  4) is a good USDA-EPA-industry cooperative venture;
  5) spreads development costs over several markets.
- Favorable, but more workable in the non-food uses.
- Favorable, although may not contribute to innovation.

EPA-Other:

- Favorable, would be cost effective; save money.

ETIP:

- Favorable, some questions regarding technological feasibility of implementation.

Other Government Agencies:

- Favorable, because of emphasis on minor crops.
- Unfavorable because of environmental risk; validation needed that it could be done safely

ADL Project Staff:

- Generally good idea but requires sound scientific basis

10. Insurance for IR-4

Through a fund available to IR-4 from USDA, reimburse farmers for crop losses due to use of product registered through the IR-4 program during the first two years after registration.

Goals: Encourage pesticide companies to register a product through IR-4.

Action Agent: USDA

Industry:

- Favorable, although it will not have much effect on the specialty field.
- Such a program would be misused in the claims area, both by farmers and the pesticide industry.
- Would be too costly in claims; question remains regarding payment of premiums--industry or government? Likely not feasible in either case.

EPA-OPP:

- Deserves further study.
- Favorable; should be combined with Incentive number 2 - Government Insurance for Farmers Using Improved Pest Control Methods.
- Not useful, because:

  1) insufficient incentive for farmers to use a new pesticide;
  2) efficacy and performance are not problems; rather, environmental risk is key problem and the focus of IR-4 should remain here.

ADL Project Staff:

- Implementation of this incentive could be complicated and unpredictable, particularly because EPA would have to initiate the funding in USDA or provide the funds themselves.
- Incentive value is questionable, as pesticide companies may still believe the risks are too great. Companies evaluate not only financial, but also public image risks.

11. Government Support to Users of a USDA IPM Service

At the initiative of EPA, set up an IPM advisory service for farmers, including among the advisors the USDA Extension Service and representatives of companies whose products could be used in IPM.

Goals: 1) Encourage companies to get their products into an IPM program.
2) Inform farmers of IPM and encourage them to use these methods.

Action Agent: EPA, USDA; pesticide companies

Industry:

- Unfavorable; would be very expensive with little return.
- Unfavorable; coordination and required mechanism too complicated to work; against hiring of more government employees.
- Unfavorable; a new IPM advisory service is not needed as IPM has been practiced for years by good entomologists, plant pathologists and extension agents; effective services are used without additional incentives.
- EPA should not be involved here; rather USDA and the pesticide companies.
- Current program could be improved through increased involvement of pesticide companies. Program structure should center on USDA service to extension personnel, with advice of pesticide companies. EPA should not be involved.

Associations:

- Favorable; government support for IPM users is necessary. (Sierra Club and EDF)
- Undesirable; a federally funded IPM advisory service would be in direct competition with the private sector. (American Farm Bureau Federation)

EPA-OPP:

- Worthy of further study, but implementation could be complicated and encourage bureaucratic red-tape; preservation of USDA and industry roles necessary.
- Very favorable; one of the best incentives--assuming USDA heartily endorses the program. It would be costly, but would achieve success if properly run, publicized and evaluated.
- Favorable, if made available free to users.

EPA-Other:

- Unfavorable; expansion of IPM supportable only if cost/benefit analysis justifies additional personnel.
- Favorable, if extension service added additional personnel.

Other Government Agencies:

- Favorable; first, demonstration could be conducted with the Extension Service involved to monitor demonstrations and transfer knowledge and practices to farmers.

ADL Project Staff:

- EPA and USDA should not be involved in this, particularly since their involvement greatly increases the number of actors that would need to agree in order for the advisory service to be effective. Rather, industry or trade associations should initiate such a service on their own.

12. Subsidy for IPM

Government support (by direct subsidy, tax credits, or returns) to agricultural groups or farmers in a region who use IPM techniques rather than traditional pest control methods.

Goals: Encourage farmers to use IPM rather than traditional chemical controls.

Action Agent: USDA, EPA

Industry:

- Unfavorable; incentive as written implies that IPM does not include use of chemical pesticides.
- Unfavorable; farmers should try new programs at own risk.
- Unfavorable; farmers will use any effective IPM program; a subsidy is not needed.
- Unfavorable; very costly and questions remain as to who would finance the program.

EPA-OPP:

- Favorable, if implemented in conjunction with incentive number 11, Government Support to Users of a USDA IPM Service. The subsidy could be broadened to include IPM private organizations--to provide low cost service and advice to farmers.
- Favorable; payment for trying new methods will be an incentive to farmers.

Other Government Agencies:

- Unfavorable; government subsidy for IPM is inappropriate as it charges public twice for the same thing--once by government tax-subsidy, once by product purchase; opposed to subsidies in general.

EPA Project Staff:

- Feasible if self-supporting IPM programs can be identified.

ETIP Project Staff:

- Not supportable until commercial and educational methods of promoting IPM are explored.

ADL Project Staff:

- Federal money may be needed to overcome farmers' hesitation to use innovative pest control methods, but in the long term, these methods must support themselves.

13. Rights to IPM

Sell, through a federal mechanism, exclusive rights to biological controls to private IPM enterprises in order to increase the use of IPM.

Goals: Increase the use of IPM.

Action Agent: Federal government

Industry:

- Favorable; this approach has appropriate emphasis, that is, private IPM concern can sell the program, provide necessary monitoring personnel, and guarantee the results.
- Unfavorable; selling "rights" for biological control to private enterprise is selling programs that don't exist.
- Unfavorable; is another layer of bureaucracy; also Dept. of Justice would oppose this as anticompetitive.

EPA-OPP:

- Unfavorable; administrative difficulties likely.
- Not feasible; biological controls are not patentable.

Other Government Agencies:

- Not feasible from legal standpoint.

EPA Project Staff:

- Further definition of rights required.

ETIP Project Staff:

- Further definition of rights required.

ADL Project Staff:

Probably not feasible in view of copyright and proprietary protection laws.

14. Reorganization of USDA Research in Biological Control

Reorganize USDA research on biological controls to include more IPM testing, product or program development, and pest-targeted efforts.

Goals: Provide more biological control and IPM programs.

Action Agent: USDA

Industry:

- Favorable, but information should flow freely to farmers to do with as they want and to private enterprise to exploit as it sees fit.
- Unfavorable; the only reorganization needed is to return to the old Entomology Research Service (ERS) and to put more emphasis (and money) into practical research to solve the immediate pest problems of the farmer.
- Impractical; USDA is already doing considerable research in this area and results, as measured by useful products, have been generally poor.
- Possibly useful; although USDA biocontrol research and promotion has not been very effective.

Associations:

- Very favorable; however getting the reorganization through Congress would be difficult. (Sierra Club)

EPA-OPP:

- Favorable; reorganization is needed but USDA must take initiative with EPA playing a support role.

EPA-Other:

- Favorable; more effort on biological control would be good.

Other Government Agencies:

- Favorable and feasible; it requires no money, no outside agents and no regulatory actions.

EPA Project Staff: Not feasible.

ADL Project Staff:

- USDA is doing considerable research in this area. EPA could provide selective funding for additional research. However, they may not be in a position to do so administratively.
- Reorganization of biological control across agencies is probably valuable.

15. IPM Copyright

Provide copyright or similar protection for IPM systems in order to provide royalties to system developers.

Goals: Stimulate development of IPM systems.

Action Agent: Federal Government

Industry:

- Favorable, if a practical system develops.
- Not feasible now as such systems do not exist.

EPA-OPP:

- Not feasible.
- Not the type of activity that should be placed under copyright.
- Organization, development and administration all would be difficult.

Other Government Agencies:

- Not feasible; likely that IPM cannot be copyrighted.

EPA Project Staff:

- Not an incentive (no reasons discussed).

ETIP Project Staff:

- IPM could be promoted better through protection via other mechanisms (unspecified).

ADL Project Staff:

- This could be an effective incentive in that it would provide exclusivity to the IPM system creator. However, in many cases, it is doubtful that the royalties involved will be sufficient to have much incentive value. In addition, the implementation would be difficult, as would enforcement.

16. Reduced Registration Time for Safe Products

Reward companies that develop safe pest control products by providing a shorter and less expensive registration process.

Goals: Encourage the development of safer products.

Action Agent: EPA (OPP)

Industry:

- Favorable because:
  1) There is currently little incentive to develop "safe" pesticides largely because it takes just as long for these, as for the more toxic ones, to reach the market. Despite problems defining safety, the key point is to reduce registration time.

  Unfavorable because:
  1) Definition of "safe" is not possible, particularly prior to registration.
  2) Registration should not be prioritized; prejudice and favoritism implied.

Environmental Associations:

- Unfavorable on the grounds that all products registered are supposed to be safe if used according to directions.
- Feasible, if criteria can be defined for safe products.

EPA-OPP:

- Unfavorable because:
  1) Safety is jeopardized.
  2) Registration Division could not handle it administratively.
  3) Difficult or impossible to identify a priori a safe product. In fact, unfamiliar types of products may take longer to approve.
  4) Difficult to reconcile "safe" with "less expensive," data gathering is expensive.
- This should be done but it has been tried before, but shortening registration time was unsuccessful.
- This should be expanded to include safe and effective products.

EPA-Other:

- Prioritizing should not occur in the registration process.
- Favorable, if feasible.
- This already occurs; safer products move through the process more quickly.

Other Government Agencies:

- Unfavorable. Although in favor of reducing registration time, in general, cannot be done for safe products. Difficult to define safe and set priorities.

EPA Project Staff:

- Favorable, if combined with incentive number 20, Reduced Time and Cost of the Registration Process.

ADL Project Staff:

- Unfavorable; incentive value is low because:
    1) It is impossible to adequately define safe.
    2) Decreasing cost and time of registration is not as significant an influence in pesticide R&D decisions as anticipated market and competitive edge.
    3) Manufacturers will object to preferential treatment for "safe" products.

17. Facilitate Registration Process for Innovative Products

Through granting of priorities for, and changes in, administrative procedures, facilitate review of experimental permit and registration applications for innovative pest control products.

Goals: Promote innovative R&D by providing a reward for innovative products. (This action would help eliminate a current disincentive, i.e., innovative products frequently experience registration difficulties because registration guidelines are not structured to accommodate their innovative features and approaches.)

Action Agent: EPA (OPP)

Industry:

- Favorable, although: innovative pesticides are not necessarily safer for the user, environment, or consumer of food; innovative needs to be defined. Innovative has different meanings to farmer, public, environmentalist.

- Favorable because:

  1) Frequently current practices are disincentives to new or innovative products (as discussed above under Goals).

- Unfavorable because:

  1) "Innovation" cannot be defined.

  2) Registration should not be prioritized.

  3) Innovation alone is not sufficient basis on which to reach a judgment.

Environmental Associations:

- Agreement with incentive.

EPA-OPP:

- This should occur to everyone.

- Not feasible in that identification of innovative products isn't possible. Registration may take longer because of innovative nature of certain products.

- Has little incentive value, but is an easily solved managerial problem.

EPA-Other:

- Favorable, if feasible, although questionable whether prioritizing should occur in registration.

- Difficult to define innovative and safe.

Other Government Agencies:

- Unfavorable; difficult to define innovative.

ADL Project Staff:

- Impractical because:

    1) "Innovative" cannot be adequately defined.

    2) Implementation and administration would necessarily be very complex and likely not decrease registration time sufficiently enough to provide an incentive for R&D.

18. Reduced Registration Requirements for Biological Controls

Encourage the development of biological control methods by administrative or substantive changes in the registration process that reduce the requirements for these products.

Goals: Encourage development of biological controls.

Action Agent: EPA (OPP)

Industry:

- Unfavorable because:
  1) There is no justification to giving one type of "low hazard" control advantage over another type of "low hazard" control, registration should not be prioritized.
  2) Discriminatory. This is against the law and would be litigated. Congress did not give EPA such statutory authority.
  3) Biological controls are not necessarily safer than chemical methods of control.
  4) This implies a 'checklist' approach rather than application of reason to each case.
- Biological controls must be defined to clarify whether they are limited to only bacteria and viruses.

Farm Associations:

- Reduction in requirements for registration for biological controls would be a blatant admission of current over-regulation.

Environmental Associations:

- Not favorable; preferential treatment in any area, including biological controls, is not justified.

EPA-OPP:

- Unsafe to reduce requirements; in fact a longer review time may be needed due to their relative newness to the registration process.
- Not feasible until the entire area of biological control methods has evolved considerably.

EPA-Other:

- There should be a better way to handle biological controls in the registration process, but it should not include a reduction in requirements. Biological controls are not "a priori" safe.

Other Government Agencies:

- Unfavorable; biologicals may require more rather than less testing due to their unfamiliar nature.
- Feasibility and practicality of further streamlining registration requirements questioned.

ADL Project Staff:

- The requirements for registration should not necessarily be reduced, but should be made more relevant to biological controls.

19.* Decreased Uncertainties of Registration Process for Applicants

Through changes in the staff and procedures at EPA, specify specific time frames and establish stable and clear procedures for the registration process in order to stimulate registration of more products.

Goals: 1) Promote more pesticide R&D by increased communication and understanding between industry and EPA and hence, decreased uncertainty for industry.

2) Encourage in industry "go-ahead" decisions on borderline major-minor use production.

Action Agent: EPA, USDA, others

Industry:

- Favorable because:

  1) Registration process needs clarification and addition of specific time frames for procedures.

  2) Currently Section 3 guidelines have become for many bureaucrats minimum legal checklists. However, more data can be requested which leads to more delays and uncertainties, and little predictability.

- This is an extension of current stated practice. Rather, empower EPA to hire advocates to expedite attractive materials through existing registration process.

Environmental Associations:

- Favorable; no reasons discussed.

EPA-OPP:

- Feasible, but incentive value is questionable.
- Is already being done; additional effort not necessary.

EPA-Other:

- Strongly disagree; the registration process must be uncertain if EPA is to do its job effectively.

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*Incentives 19 and 20 were viewed, by far, as the most favorable by industry.

Other Government Agencies:

- Favorable; would help reduce uncertainty and allow better investment decisions by companies.
- Favorable; suggests a provisional registration whereby a manufacturer signs an affidavit that his product fits stated specifications. Risk of future rejection by EPA remains. However, public health risks may be too high.

ADL Project Staff:

Recommend implementation, but the effects on innovation are long term.

20.* Reduced Time and Cost of the Registration Process

Streamline and/or reorganize both administrative and technical requirements of registration in order to achieve more registered products and more products registered for minor uses.

Goals: 1) Increase products registered by reducing time and cost of the registration process.

2) Encourage industry to develop minor use products.

Action Agent: EPA (OPP)

Industry:

- Favorable because:

  1) We (industry) would welcome opportunity to periodically review with EPA the progress of the development of a chemical to final registration. Also, would save us time and money.

  2) Both managerial and data evaluation need improvement. Product Manager (PM) system is one step in right direction; many others needed as implied under this incentive. Suggestions include:

     a) one reviewer per application
     b) improve "estimated time to answer"
     c) staff for peak loads
     d) allow application to retain place in review order when more information requested
     e) institute reviews of initial EPA work
     f) create arbitration rules to resolve disputes between applicant and reviewers.

- Unfavorable because:

  1) Introduced alone this would not induce change. Time to process applications is small compared to amount of time spent collecting data and doing field trials.

Environmental Associations:

- Favorable, as long as effectiveness of review process is not decreased.

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*Incentives 19 and 20 were viewed, by far, as the most favorable by industry.

EPA-OPP:

- Favorable if done for all pesticides.
- Feasible, but value as incentive is questionable.
- Review of minor use pesticides should be expedited but minor use registrations as such should not be encouraged. Also, minor uses should be more the concern of USDA.

EPA-Other:

- This will occur naturally and should not be artificially induced.
- Favorable, provided emphasis remains on making registration process easier, but not less stringent.

Other Government Agencies:

- Favorable, although favoring of certain products seen as questionable.

ADL Project Staff:

- Although current efforts to meet this objective are underway, they should be broadened and expedited without compromising the intent of FIFRA.

21. Registration of Only the Safest and Most Effective Product for Each Use

By extremely selective registration of only the most desirable products, encourage continual new product development incorporating ever increasing safety and effectiveness.

Goals: Encourage continual new product development incorporating safety and effectiveness

Action Agent: EPA (OPP)

Industry:

- Unfavorable because:

  1) Approach is wrong. Rather, set a minimum safety requirement and let competition in the marketplace decide which pesticides will be used.

  2) Comparative toxicity should never be a criteria for registration.

  3) This is illegal under FEPCA, Section 3.c.5. EPA would be exceeding their mandate.

  4) Impossible to determine prospectively which products will be safest or most effective.

  5) This is actually a disincentive to development.

  6) Safety cannot be defined.

Environmental Associations:

- Unfavorable, no reasons discussed.

EPA-OPP:

- Unfavorable because:

  1) is a disincentive
  2) is illegal
  3) is already being done; additional effort not necessary

EPA-Other:

- Unfavorable; is anti-competitive.

Other Government Agencies:

- Unfavorable; illegal, risky.

EPA Project Staff:

- Impossible to do; illegal.

ADL Project Staff:

- Implementation likely would be impossible because:

  1) such selective registration counters legislative history and probably would require new legislation.

  2) a definition of "safe and effective" backed with criteria and standards would be almost impossible.

- Incentive value would be negligible because in efforts to define "safe and effective" EPA would be forced to seek the lowest common criteria or denominator. Thus, if any effect occurred, it would be to foster sameness rather than innovation.

22. EPA Screening/Testing of Innovative Pesticides

Arrange testing of promising innovative pesticides without compromising the proprietary position of the developer in order to reduce testing costs. (Modeled after the drug screening programs of the National Cancer Institute.)

Goals: 1) Decrease the relative cost of development of innovative versus non-innovative pesticides.

2) Allow pesticide development by parties possessing limited capital.

Action Agent: EPA

Industry:

- Favorable; although if a pesticide fails in EPA tests, industry should still be allowed to present counter data with a fair chance for evaluation.
- Favorable, if done by USDA, not EPA.
- Unfavorable because:
  1) EPA should not be involved and USDA should not assume any additional testing role.
  2) It would be very time consuming.
  3) Question of keeping data proprietary.

Environmental Associations:

- Unfavorable; no reasons given.

EPA-OPP:

- Favorable because would reduce costs to industry. However, current EPA pesticide budget would not permit the program; thus, Congress would need to agree and produce a special appropriation.
- Favorable, if done by USDA or other agencies, not EPA.
- Unfavorable, because government testing more expensive than industrial testing.

ADL Project Staff:

- Unfavorable; too complicated and difficult to implement in that it involves defining "innovative" products, establishing a testing system, and developing a system to protect proprietary information. Further, the testing system would be costly to taxpayers with virtually no cost to industry.

23. Government Funding of Environmental and Residue Testing for Minor Crop (and Specialty) Pesticides

Fund environmental and residue testing of minor crop pesticides at non-government organizations in order to reduce product development costs to companies.

Goals: 1) Decrease the relative cost of commercialization of pesticides for minor crops.

2) Allow pesticide development by parties possessing limited capital.

Action Agent: federal government

Industry:

- Favorable only if USDA, not EPA is agency involved. EPA could not be sufficiently objective due to the conflict between its promotional and regulatory roles.

- Favorable for USDA, but it likely would lengthen registration time.

- IR-4 already has assumed this role.

- Favorable if long-term toxicity included.

- Favorable only if the definition of minor crops is based on the sales of pesticides for the crop rather than of the crop's value. Additional careful definition would be needed to prevent inclusion of groups such as orange growers whose crop acreage is small but value high.

Environmental Associations:

- Unfavorable because of the difficulty in defining minor vs. major crops.

EPA-OPP:

- Favorable only if limited to cases where the government has a broader interest and there is no additional cost to the government.

- Favorable if done through USDA or a quasi public corporation; also such a program should involve more than one agency given the complexity anticipated.

- Unfavorable, because:

  1) More expensive than private sector testing.

  2) EPA should not pay for testing of this sort.

EPA-Other:

- Favorable, but change and limit emphasis from minor crops to those situations in which there is a real unmet need; careful screening of pesticides for inclusion would be required.

- Favorable, but Congress would likely not appropriate the needed capital ($10 million estimated), nor the giving of a five-year mandate to EPA (a regulatory agency with a controversial track record).

ADL Project Staff:

- Industry development costs would not be greatly reduced in that residue data for minor crops already can be obtained through IR-4 and environmental data usually is not required for minor crop registration, if the product has been registered for other crops.

24. Government Generation of Environmental and Residue Data for Minor Crop and Specialty Pesticides

After submittal by pesticide developer of efficacy and toxicity data, USDA or EPA conduct environmental and residue testing necessary for registration.

Goals:
1) Focus research and development on minor crop and specialty pesticides.
2) Decrease the relative cost of development of such pesticides.
3) Have the public pay for the maintenance of public concern with environment and residue.

Action Agent: EPA or USDA

Industry:

- Favorable if USDA, not EPA, is the sponsoring agency. However, chances of success are questionable due to limitation of USDA staff and experiment stations; testing time likely would be lengthened.

- IR-4 already has assumed this function. Also, environmental data are already available when a material has been registered on another crop.

- Favorable if toxicity data required by industry is limited to the acute data with government conducting the rest of the tests.

- Although government should fund, actual testing should be done by non-government laboratories for reasons of efficiency and speed.

- Unfavorable because this sets up registration functions in a sequence, thus increasing the registration time. Industry usually conducts tests in parallel.

- Unfavorable because industry feels its business is based on its ability to do chemistry and residue work; hence there is no interest in encouragement of this work in the public sector.

Environmental Associations:

- Unfavorable; would involve too much government time and money.

EPA-OPP:

- Favorable only if limited to cases where the government has an interest in the product. There should be no additional cost to the government.

- Favorable if USDA does environmental testing and HEW conducts residue tests.
- Favorable if not limited to minor uses but includes all products.

EPA-Other:

- Unfavorable; government funded, rather than government performed tests preferred because of effectiveness and cost.

Other Government Agencies:

- Favorable in that this incentive parallels an ETIP project on paints. Indications to date are that such government services can provide assistance in commercializing new paint formulations.

ADL Project Staff:

- Testing by government might decrease the cost to industry, but may cause unnecessary delays.

25. Efficacy Screening of Potential Pesticides

Conduct either primary or field efficacy screening of potential pesticides at government laboratory (USDA) for a standard fee.

Goals: 1) Decrease initial investment required for new pesticide development.
2) Focus on identification of pesticides for neglected "important pest problems."

Action Agent: USDA

Industry:

- Favorable if limited to secondary screening of industry-sponsored pesticides; should not apply to primary screening.

- Unfavorable because:

  1) This is a proper role for industry; not government. Auxilliary testing by federal facilities for a fee is acceptable, provided government and industry data given equal consideration in the registration process.
  2) Private rather than government labs would be more efficient and here a company would have some control over quality and scheduling through payments.

Environmental Associations:

- Favorable, but the Department of the Interior and the USDA already do this.

EPA-OPP:

- Favorable because:

  1) This could be an incentive to small business, depending on the fee. The laboratory should be USDA-EPA sponsored, not just USDA.
  2) Consistency in the registration process would be improved.

- Unfavorable because:

  1) This should be done by industry.
  2) Government testing would be more expensive than industry testing.
  3) It is industry's responsibility to develop effective products.

- Already being done by state and federal facilities at no fee.

ADL Project Staff:

- A large screening program could be very efficient and effective, helpful particularly for small companies. Setting up such a large program would be difficult and complicated, but could be done.

26. Government Testing of all Registration Parameters

Provide a government service and facilities for testing of those parameters required for registration. Charge fees consistent with costs of in-house testing by pesticide industry.

Goals: Insure that data generated meets the requirements of registration, thus providing regulatory consistency and predictability and reduction in delays and costs to industry.

Action Agent: EPA and USDA.

Industry:

- Unfavorable because:

  1) Government would be almost completely in control of the registration process, except for financing.
  2) Such facilities would be huge and hence slow, resulting in even more delays in the registration process.
  3) This would double an already enormous cost.
  4) This is of no advantage to anyone.
  5) Would allow companies without expertise to get into the business and thus decrease the overall integrity of the industry.

Environmental Associations:

- Favorable; no reasons given.

- Unfavorable; no reasons given.

EPA-OPP:

- Unfavorable because:

  1) This amounts to socializing the R&D process.
  2) Would be very costly for taxpayers.
  3) Industry responsibility and control eliminated. Industry would not accept this.
  4) Would put many small business out of business due to fees.

ADL Project Staff:

- Unfavorable; likely both time and cost of registration would be increased.

27. Government Certification of Private Laboratories for Testing of Pesticides

Certify private laboratories for pesticide testing in order to guarantee acceptability of results for registration.

Goals: Reduce industry time and costs for registration by eliminating the necessity of repeating tests.

Action Agent: EPA or USDA

Industry:

- Favorable because:
  1) Current pattern shows that registration personnel favor data from certain laboratories over data from others.
  2) There is great variability in the quality of data coming from different laboratories.
- Unfavorable because:
  1) This implies that data from labs other than government and universities are inferior.
  2) There are better ways to solve the problem of misinformation, such as stronger penalties.

Environmental Associations:

- Favorable; would like to see certified safety laboratories forming independent quasi-public, quasi-private analysis as a third part in the registration reviews.

EPA-OPP:

- Favorable because:
  1) It would promote dependable data.
  2) Would assure better data production.
  3) But certification may be very costly to taxpayers or to pesticide purchasers.
- Unfavorable because:
  1) Certification cannot be done effectively or efficiently; it is too political in nature.

ADL Project Staff:

- This does not address the major registration problem related to testing--that is the requirements of additional tests following data submittal. Required repetition of tests due to invalid methods is not presently a problem.

28. Government Large-Scale Field Studies of Generic Representatives of Innovative Pesticide

Provide to industry the results of large-scale government testing of generic pesticides; accept data as part of registration requirements for pesticides in the class.

Goals: Decrease the uncertainties associated with innovative, novel pesticides regarding field efficacy, environmental disposition, etc.

Action Agent: EPA or USDA.

Industry:

- Unfavorable because:

  1) There are large problems with what constitutes any given class; approach would necessarily be unscientific.
  2) It is not feasible. Analogs are very different in their response.

Environmental Associations:

- Favorable; no reasons given.

EPA-OPP:

- Favorable; costs would be reduced.

- Favorable, but certain government agencies already do this.

- Unfavorable; working with generics is dangerous due to the the generalization required.

ADL Project Staff:

- The relationship between results of testing generic classes of pesticides and individual applications for registration is not clear.

29. EPA Generation of Additional Registration Data

Following completion by the applicant of all tests required for registration, conduct additional testing in government laboratories or under contract to EPA.

Goals: Decrease the costs (to industry) and delays as a result of requests for additional tests.

Action Agent: USDA or EPA.

Industry:

- Favorable; this would speed up the process. However, clear procedures would need to be established.
- Unfavorable because:
  1) Tests additional to those required for registration should not be required.
  2) EPA could use this as a procedural device for stalling unless strict safeguards were employed.
  3) Companies consider time far more important than additional cost. This arrangement would slow down testing considerably. Modification to this incentive is for EPA to notify applicant of all data deficiencies simultaneously, thus allowing prompt completion of the additional requirements.
  4) Industry should maintain responsibility for control of obtaining data on their compounds.

Environmental Associations:

- Favorable, although may not be feasible as industry would probably object to the provision that government would be able to retain the information (leading to 3(c)1(D) problems).

EPA-OPP:

- Unfavorable because:
  1) This implies EPA is penalizing itself for taking precautions.
  2) Not feasible; no reasons given.
  3) EPA should define all data required for registrants. (This is currently in progress.)

EPA-Other:

- Favorable, but costly.

ADL Project Staff:

- Although this would place the financial burden on government, and reduce cost to industry, the delays caused would be unacceptable to industry.

30. Government Sponsorship of Commercial R&D on Biological Controls

Federally sponsor R&D by commercial companies on biolgical controls in order to develop more products, as well as to strengthen company skills in this approach to pest control.

Goals: 1) Increase variety of pest control methods and choice available to farmers.

2) Promote methods non-toxic to non-target organisms.

Action Agent: USDA primarily; also EPA and FDA

Industry:

- Favorable; but only if the research is funded at the commercial companies due to the slowness of government operations.
- Unfavorable because:
    1) EPA and USDA already too involved in a promotion of biological controls.
    2) If the company sponsored will be the eventual developer of the product, they would have an unfair advantage.

Environmental Associations:

- Favorable; such sponsorship is required if biological controls are to become successful.

EPA-OPP:

- Favorable because:
    1) Would reduce industry costs, but should not be sponsored by EPA.
    2) Would be a strong incentive. However, Congressional approval and funding would be difficult to obtain.
- Unfavorable because: very costly to the government and industry may reject it as interference.
- This is already being done, usually by USDA, but results are not made available to the public.

EPA Other:

- Favorable because: it will bring needed skills to industry.

ADL Project Staff:

- A costly program, which is not desirable to many companies due to the risk to subsequent proprietary protection.

31. Increase EPA Funding of R&D

Substantially increase EPA funding of R&D, emphasizing innovative pesticides and potentiation of new and existing pest control methods.

Goals:
1) Increase variety of methods available for pest control
2) Reduce development costs for industry.

Action Agent: EPA/OPP

Industry:

- Favorable; but only if safeguards for proprietary data could be employed and the patent situation improved.
- Unfavorable because:
  1) EPA should not be promoting these methods; role should be limited to regulation.

EPA-OPP:

- Favorable because: would reduce industry costs, but should not be sponsored by EPA.
- Favorable; but should be financed by USDA through universities.

ADL Project Staff:

- Increased EPA funding alone could not be sufficiently large to impact the R&D process. Therefore, implementation of this incentive should be explored as a cooperative program with other agencies such as USDA and NSF which could provide both additional funds and appropriately trained staff.

32. Government Funding of Basic Research

Fund a coordinated program of long-range basic research, under government sponsorship to promote new pest control methods.

Goals: 1) Create a research base to promote increased variety and supply of pest control methods.

2) Reduce industry costs of basic research.

Action Agent: Federal Government (EPA, USDA, FDA), States, private laboratories (under contract).

Industry:

- Favorable; if sponsored by USDA, not EPA.
- Favorable; if most or all of the funding goes to industry.
- Favorable; if funded through universities, particularly land-grant colleges where it could serve to train advanced personnel in a manner similar to research sponsored by the National Institute of Health.

EPA-OPP:

- Favorable; because it would reduce industry costs.

EPA Project Staff:

- EPA has already been attempting to clarify many aspects of their R&D program.

ETIP Project Staff:

- This might be facilitated by a tie between OPP and NSF.

ADL Project Staff:

- Deserves further consideration.

33. Government Funding of Applied Research

Fund a coordinated program of applied research under government sponsorship, on new pest control methods.

Goals: 1) Increase the variety of commercially available pest control methods.

2) Decrease industry costs of applied R&D.

Action Agent: Federal (EPA, USDA, FDA), states, private laboratories (under contract).

Industry:

- Unfavorable because:
  1) This would be subject to great misuse if limited to new pest control methods.
  2) Government should not be involved in applied research.

EPA-OPP:

- Favorable; because it would reduce industry costs.
- Unfavorable because: not necessary; no reasons given.

EPA-Other:

- USDA support should be increased, but only to the extent that EPA funds alternative pest control measures.

ETIP Project Staff:

- Giving money to industry with little government control would not be acceptable to EPA.

EPA Project Staff:

- Government funding is not available for this.

ADL Project Staff:

- Except in limited areas, industrial groups are most likely to fund research because it is closest to the marketplace. Therefore, having the government do what industry, agricultural field stations, and trade associations naturally do now is a wasteful duplication of effort.

34. Government Funding of Research on Formulation and Application Methods

Fund, by the government, research to increase the cost effectiveness of pesticide applications, by means of safer formulations and better application methods.

Goals: 1) Increase effectiveness and reduce environmental hazards of formulations and applications.

2) Reduce industry R&D costs.

Industry:

- Favorable if sponsored by USDA and limited to application methods. Formulation research should be done by industry.
- Unfavorable because: industry is best equipped to do research in both of these areas.
- Not necessary; already done to some extent by the states and USDA.

EPA-OPP:

- Unfavorable because:
  1) Would likely act as a disincentive; no reasons given.
  2) Should occur as a joint industry-government-project rather than as a full subsidy to industry.

EPA-Other:

- Unfavorable because this is too far into the market sector for government interference; it could interfere with market competition.
- Favorable; no reasons given.

Other Government Agencies:

- Need in this area is not for more government funding of research but more coordination of funding emanating from a variety of agencies. A 1976 House Bill, H.R. 11743, calls for establishment of a National Agricultural Research Policy Committee which might serve such a function.

ADL Project Staff:

- USDA and the pesticide industry have been doing significant and useful R&D for 30 years or more. Creation of a new separate agency to perform similar functions would be wasteful and unlikely to lead to any innovation.

35. Definition of Standards for Safety

EPA clarify the concept of "safety" and its requirements for registered pesticide products, both within EPA and through more EPA participation in ASTM's Pesticide Committee and ANSI's new Environmental Council.

Goals:

1) Encourage stable and responsible industry participation in pesticide work.

2) Reduce industry uncertainties and costs by working within predictable standards and regulations.

Industry:

- Favorable because:

  1) Such a definition is necessary. However, the ASTM and ANSI work too slowly for needed conclusions. Also, in many cases they lack the proper expertise.

  2) Such a definition is necessary since EPA's standards can be described as sliding. However, definition should be formulated without using the term safety since it has no statutory significance.

- Unfavorable because:

  1) Could lead to even more of a "checklist mentality" by reviewers; thus further removing judgment from the registration process.

  2) If definition were of the checklist nature, it would be a disincentive to innovation and flexibility.

EPA-OPP:

- This is already being handled by promulgation of regulations guidelines.
- Favorable if sufficiently flexible to recognize that the concept of safety will change with time and progress.

EPA-Other:

- Favorable; the government should be clear in its objectives and is already working on setting standards for safety.

- Favorable; EPA has needed this for a long time.

Other Government Agencies:

- "Safety" needs further definition, but this is a difficult task.

ADL Project Staff:

- Any work that the government can do to fill in the gaps in the data base for pesticides and their impact on the environment is useful. Therefore, helping to develop data to define how safe is safe and increasing basic knowledge is useful, and is an area that only the government can take ultimate responsibility for.

- Stabilizing safety standards is complex and perhaps impossible. Funding of research to define safety would be difficult. Further, standards must be continually revised to incorporate new information. Hence, more research could lead to less stability.

36. Training of Farmers and Applicators

Promote new methods of safe and effective pesticide use by conducting seminars and other training for farmers and applicators via their own organizations or state extension services.

Goals: 1) Introduce new methods to user.
2) Reduce user's confusion, irritation and costs of selecting and applying new chemicals.

Action Agent: USDA and EPA

Industry:

- Favorable because:

  1) These organizations and services are respected by farmers.

  2) Although it has no incentive value for companies, it is a good idea for education of users. Education should, in the long run, reduce the amount of regulation required.

- Unfavorable because:

  1) Farmers are not likely to attend meetings; futher, they already know much about safe and effective pesticide use.

Environmental Associations:

- Favorable; especially if implemented through the extension services

- Favorable; however, it should be expanded to include IPM.

EPA-OPP:

- Favorable; but USDA, not EPA, should assume responsibility.

- Favorable; but already being done by the Operations Division. Information manuals for users of ten categorical types are currently being developed through contracts with universities and state extension services. Promotional efforts could be increased.

- Already being done, but is not an incentive.

EPA-Other:

- Favorable; particularly if implemented through established agricultural channels, extension services, county agents etc.

Other Government Agencies:

- Favorable; but not directly related to the impact of FIFRA; not an incentive.

ADL Project Staff:

- Incentive value is questionable. Education alone will not convince users to change methods and products. Products and methods advocated must be more effective and less costly.

37. Independent Pesticide Research Foundation

Set up an independent, non-profit organization through collaboration of government and industry to disseminate impartial information and conduct a responsible public education program.

Goals: 1) Improve the quality of technical and policy debates.
2) Reduce uncertainties and costs resulting from criticisms by ill-informed observers.

Action Agent: A new institution, backed by industry and government.

Industry:

- Favorably; but not likely to occur.
- Unfavorable because:
  1) This would be just one more organization superimposed on the many that farmers have to deal with now.
  2) Not needed, and if established, such a foundation would become too powerful. Government should not be involved in this type of venture.
  3) No benefits to anyone; the extension services already do this.

Environmental Associations:

- Favorable idea, but the structure and implementation would need much classification and development.

EPA-OPP:

- Favorable; public and EPA need to know what each other are doing.
- Unfavorable; rather set up a National Pesticide Training Center to provide overall coordination in training of applicators, farmers and users. Initial work on such a center is underway in the Operations Division.
- A good idea, but is not an incentive.

Other Government Agencies:

- Favorable; but not directly related to the impact of FIFRA; not an incentive.

EPA Project Staff:

- Unfavorable; no reasons given.

ETIP Project Staff:

- Unfavorable; no reasons given.

ADL Project Staff:

- Difficult to coordinate with existing regulatory mechanisms and private research.

38. Federal Marketing of Pest Control Approaches

Increase public knowledge and acceptance of innovative pesticides by cooperative federal-industry programs of providing information, advertising and marketing.

Goals: 1) Reduce industry marketing costs.
2) Increase consumer confidence in products through government approval.

Action Agent: EPA, USDA

Industry:

- Unfavorable because: this is likely to be federally dominated and slanted. Furthermore, this is an area they know nothing about.

Farm Associations:

- Unfavorable; the federal government should not be in the business of advertising and marketing pesticides.

Environmental Associations:

- Unfavorable; federal involvement in marketing creates a conflict of interest.

EPA-OPP:

- Favorable; but USDA, not EPA should assume responsibility.
- Favorable; Operations Division is already somewhat involved by promoting certain measures by providing information. The Division is not involved directly in marketing.
- Unfavorable; would discriminate against older, established, safe pesticides.
- Already being done; efforts should continue.
- Unfavorable; EPA should not be involved in advertising and marketing pesticides.

EPA-Other:

- Favorable; even though it establishes EPA in a promotional role.

Other Government Agencies:

- Unfavorable; mandated role of EPA is not marketing.

EPA Project Staff:

- **Unfavorable; no reasons given.**

ETIP Project Staff:

- **Unfavorable; no reasons given.**

ADL Project Staff:

- **Unfavorable; the federal government should not be involved in marketing activities.**

39. Improvement in EPA Contacts with Congressional Overseers

Increase and regularize information flow between EPA and Congress in order to increase the understanding of the Congress and judiciary of pest control and regulation problems.

Goals: 1) For EPA, increase and regularize the information flow with Congressional committee staffs in order to facilitate realistic laws.

2) For Congress, promote a better understanding and implementation of laws.

Action Agent: EPA

Industry:

- Favorable because:
  1) Could prevent crisis confrontations.
  2) Could improve EPA's contact with Congress which needs to be more centralized. EPA currently reports to approximately 30 Congressional committees.
- Unfavorable because: EPA has too many friends in Congress already. EPA needs to listen more to farmers and industry rather than advocacy groups.
- There should be a permanent Congressional committee to oversee EPA.

Farm Associations:

- Unfavorable; neither the pesticide industry nor the users will benefit from increasing EPA's ability to lobby Congress.

Environmental Assocaitions:

- Favorable, but difficult or impossible to achieve.

EPA-OPP:

- Favorable; but likely that industry will not cooperate.
- Favorable;and already occurring to the extent time and resources allow; efforts should continue.
- Favorable; but incentive value is questionable.

EPA-Other:

- Impossible and probably unconstitutional as EPA is an executive agency.

Other Governmental Agencies:

- Favorable; but needs development and clarification.

EPA Project Staff:

- Unfavorable; not an incentive.

ETIP Project Staff:

- Unfavorable; not an incentive.

ADL Project Staff:

- Good idea, but may be naive.

40. Clearinghouse for Research Results

Encourage companies to disclose unsuccessful research efforts through a research information clearinghouse by reimbursing some portions of the research costs.

Goal: Encourage more efficient R&D work through encouraging companies to disclose negative R&D results.

Action Agent: EPA, NTIS, or professional society.

Industry:

- Unfavorable; nonsense
- Favorable; particularly if it includes formulators.
- Unfavorable; disclosure of failures to competition is unacceptable in that it indicates areas of research concentration. Prevention of competition for more negative than prevention of cost of fruitless research.
- Unfavorable; unrealistic. Companies could not participate. This would require revealing areas of research, and jeopardize research results which appear valueless in an immediate time frame but become valuable later in a different context.
- Unfavorable; disclosed information could become useful to competitors.

Environmental Associations:

- Favors the idea of public disclosure of unsuccessful research, but not at government expense.

EPA-OPP:

- Favorable, if information availability could be limited only to participating companies.
- Favorable, but not feasible. Producers will only release what they want released.
- Likely to be costly; difficult to sell to Congress without predictable cost limits.

EDA-Other:

- Favorable; if there are adequate safeguards for proprietary data.

ETIP:

- Unfavorable; although a good idea, difficult to implement; costly to exchange information in such a manner.

ADL Project Staff:

- Unfavorable because:
    1) Data of any value, either immediately or perceived as possible in the future, would be held back. Hence, a public file of non-usable information would be created.
    2) Implementation would be difficult, particularly in securing industry cooperation and in establishing acceptable methods of disclosure, payments and/or royalties.

41. Research Investment Credit

Create a tax credit similar to the current investment credit, allowing a company to offset directly its tax liability by 10 percent of the capital investment in research during the year, providing that the total does not exceed 50 percent of the pretax profit.

Goal: Encourage companies to invest in pesticide R&D activities.

Action Agent: Congress, EPA, Treasury Department, IRS.

Industry:

- Favorable, but implementation doubtful due to both Congressional and public reluctance during economic recession.
- Favorable if directed at research on safer pesticides.
- Favorable in concept, but implementation not feasible; problems focus on defining research.
- Favorable, particularly during a recession when R&D tends to be reduced. Also, such a credit would be one way for the public to pay for certain environmental safety measures they are insisting upon, currently at the expense of industry.
- Unfavorable; government should not be in any position to control industry research.
- Favorable; but criteria needed to define specifically what credit would be provided for.
- Favorable; but doubtful that EPA would cooperate.

Farm Associations:

- Favorable; has real potential as a mechanism for permitting the public to fund those things they are demanding through environmental research.

Environmental Associations:

- Unfavorable; industry already has too many tax loopholes.

EPA-OPP:

- Favorable; particularly if the research qualified for inclusion could be specified.
- Favorable; use a sliding scale investment credit to direct development to needed areas.
- Favorable; an effective incentive providing industry with substantial cost reductions.

EPA-Other:

- Favorable; but must be structured to give investment credit only for needed research, not all research.

Other Government Agencies:

- Unfavorable, as it appears to be compounding one credit upon another. Likely, the House Ways and Means Committee would be against it, considering its efforts to simplify the tax structure.
- Unfavorable due to potential cost to government. Further, Congress should not act before knowing the structure of the industry and its needs for such a credit; hence a considerable educational effort would be needed before any Congressional action occurs.

EPA Project Staff:

- Unfavorable; would be difficult to administer; makes tax laws more complex.

ADL Project Staff:

- Should be explored further due to the general desirability by industry, but implementation may be difficult.

42. Direct Subsidy of Research

Government subsidize the entire cost of R&D and registration of pest control methods that are innovative, aimed at minor crops, or otherwise not commercially attractive. Sale of patent rights by EPA, with first refusal granted to the developer.

Goal: Accelerate development of innovative pest control methods.

Action Agent: EPA, USDA

Industry:

- Unfavorable; any participation by government leads to control and patent problems.
- Unfavorable; industry should not be indemnified for its products; it should assume its own risks.
- Unfavorable; absolutely not. Government subsidy leads to government control; futher, government's record of subsidizing research in terms of actual product production has been poor.
- Favorable with modification. To avoid concerns and doubts associated with direct subsidies, establish royalty rates at which a company would repay loans from government if the product proves successful.
- Favorable, depending on price charged by EPA for patent rights.
- Unfavorable; "innovative" cannot be defined.

Farm Associations:

- Unfavorable; the problem of non-attractive commercial production should not be dealt with through subsidies. Rather, registration costs should be reduced through reduction in registration requirements.

Environmental Associations:

- Questionable; government should not be so involved in private enterprise.

EPA-OPP:

- Favorable, if subsidy is less than total cost.
- Favorable, but doubtful industry will cooperate as EPA is

given too much control.

EPA-Other:

- Unfavorable; all research should not be funded, but defining innovative and setting criteria for other research to receive funds would be too difficult.

EPA Project Staff:

- As written, is not specific enough to serve as an incentive.

ETIP Project Staff:

- This is not a role for EPA.

ADL Project Staff:

- Incentive would be too complex to implement, particularly in the areas of determining the amount of research done by a company and establishing a procedure for buying and selling data.

43. Reimbursement of Registration Costs for Pesticides for Minor Crops

Increase the availability of pest control agents for minor crops by reimbursing costs of registration of already proven agents (i.e., those registered or other crops/insects) on specific minor crops lacking alternative methods.

Goal: Encourage development and commercial availability of pest control agents for minor crops

Action Agent: EPA, USDA

Industry:

- Unfavorable; should be incorporated as regular part of IR-4 program.
- Favorable only if further developed by better defining minor crops, registration costs and other variables.
- Favorable, as a company would not lose control of its product.

Farm Associations:

- Unfavorable in that direct subsidy of registration costs is not a suitable solution; rather registration costs should be reduced by reducing registration requirements.

Environmental Associations:

- Unfavorable; no reason given.

EPA-OPP:

- Favorable; implementation could be through removing the tolerance charges (up to $10,000 per application).
- Favorable; should be a very effective incentive.

EPA-Other:

- Favorable, but the magnitude of the minor crop problem needs further definition.

EPA Project Staff:

- Favorable, although USDA would be a more appropriate agency for implementation.

ETIP Project Staff:

- **Favorable, although both the costs and the acceptable products need definition prior to implementation.**

ADL Project Staff:

- **Subsidizing registration costs for minor uses is an indirect approach. Instead, regulatory requirements should be examined for applicability for minor uses.**

44. Repayment Loan Fund for Pesticide R&D

Provide a continuing source of capital investment funds for R&D of pest control methods by establishing federal loans to industry for safety and environmental testing. Repayment of the loans is based upon product success.

Goals: Promote development of innovative pest control approaches through provision of a continuing source of capital investment funds.

Action Agent: EPA

Industry:

- Unfavorable; socialistic.
- Favorable, but costs of implementation should be examined. Also, a mechanism for distributing loan money effectively needs to be developed; perhaps the loan amount should be related to companies' R&D efforts or sales.
- Favorable, particularly for small and new businesses; could attract new companies into the pesticide business.
- Unfavorable; not an incentive and is costly to the taxpayer.

Environmental Associations:

- Favorable, especially for small businesses.

EPA-OPP:

- Unfavorable; too risky; tax incentives would be preferable.
- Worth further evaluation.

EPA-Other:

- Favorable, if focus of program is better defined. Prefer this incentive to Low-Interest Government Loans (Incentive #45), however, believe the low-interest loan is preferable for industry.

Other Government Agencies:

- Likely too complicated to conduct as a workable incentive.

ADL Project Staff:

- This provides incentive for research by providing capital for initial investments. However, it does not specifically address innovative product development. Furthermore, most product development risks should be assumed by industry.

45. Low-Interest Government Loans

Through low-interest loans from the government, provide funds for safety and environmental testing on desirable pest control methods.

Goals: Provide a source of low-cost investment funds for biological/ IPM pest control R&D.

Action Agent: EPA, or other federal agency.

Industry:

- Unfavorable; interference with free enterprise system.
- Favorable, although companies' own capital should be used for more innovative research and development efforts.
- Unfavorable; this appears to be another way to promote IPM as definition of "desirable pest control method" is required.
- Favorable; would benefit small companies.

Environmental Associations:

- Favorable; small business administration loans could serve as part of the implementation mechanism.

EPA-OPP:

- Worth further evaluation.
- Favorable, if criteria for granting of loans can be defined.
- Unfavorable; tax incentives would be preferable.

Other Government Agencies:

- This appears to be addressed to small formulators, as large ones would not need such loans.

ADL Project Staff:

- Impossible to define desirable pest control methods.

46. Water Residue Tax

Assess pesticide manufacturers with a tax based on the amount of pesticide residues found in monitoring of water bodies and rivers.

Goals: Reduce the amount of persistent pesticides in use in the country.

Action Agent: EPA

Industry:

- Unfavorable; this does not account for misuse.
- Unfavorable; this is like a continuing "fire," could be abused by a large pesticide producer.

Environmental Associations:

- Favorable, but Congress not likely to be receptive.

EPA-OPP:

- Unfavorable; would function as a disincentive.
- Unfavorable; would result in expensive court cases.

EPA-Other:

Unfavorable; unconstitutional. Further, not feasible technically.

ADL Project Staff:

- A water residue tax is politically unacceptable at this time.
- Implementation would be complicated particularly in that frequently it would be difficult to determine which manufacturer was responsible for high-level water residues.

47. Safety Tax

Create a tax on pesticides paid by manufacturers, based on the toxicity (e.g., LD_{50}) and/or persistence (e.g., half-life in aquatic muds).

Goals: Reduce the number of pesticide products on the market which create a high risk to human health and/or the environment.

Action Agent: EPA

Industry:

- Unfavorable, but if implemented, criteria for such taxes should include usefulness of the product as well as safety, toxicity, etc.
- Unfavorable; registration requirements already constitute a form of safety tax.
- Unfavorable and unfeasible; difficult to establish conditions and criteria for safety. Taxes on a use basis more acceptable than this.
- Unfavorable; pesticide qualities should not be the basis for taxes.

Farm Associations:

- Unfavorable, neither toxicity nor persistence is a viable measure of safety.

Environmental Associations:

- Favorable, but Congress not likely to be receptive.

EPA-OPP:

- Unfavorable; not practical to enforce.
- Possible, if based on poundage of pesticides sold.

EPA-Other:

- Favorable; when fees (taxes) are levied, society is being repaid. Favors taxing manufacturers over users.

ADL Project Staff:

- Selecting indicators upon which to base the tax would be difficult.

48. Pesticide Use Tax

Charge pesticide users a use tax based on criteria such as toxicity, environmental parameters, safety, etc., fund research with tax revenues.

Goals:
1) provide incentive for industry to manufacture and sell "less harmful pesticides;"
2) provide an incentive for users to purchase "less harmful pesticides;" and
3) provide a source of revenue which can be returned to manufacturers and others to support R&D efforts on "safer pesticides."

Action Agent: EPA and other federal agencies.

Industry:

- Unfavorable, but if implemented, criteria for such taxes should include usefulness of the product as well as safety, toxicity, etc.
- Unfavorable; approved levels of toxicity are already written into registration procedure.
- Of dubious value; it would be difficult to set criteria for such a tax.

Farm Associations:

- Unfavorable; a use tax would become an additional negative incentive to consumption and use and would thereby compound the minor crop problem.

Environmental Associations:

- Unfavorable; criteria would be too difficult to define and enforcement would also be problematic.

EPA-OPP:

- Unfavorable, would function as a disincentive.

EPA-Other:

- Favorable; when fees (taxes) are levied society is being repaid. Favors taxing manufacturers over users.

ADL Project Staff:

- EPA cannot adequately define the necessary criteria for a use tax to be implemented successfully.

49. Modification of Patent Issue Date and/or Duration

Provide, through modification of the patent process, a specified period of product protection, taking into account delays caused by the government, and thereby encourage industry to develop new products.

Goals: Encourage industry to develop new products by improving the changes of obtaining a return on their investment.

Action Agent: Department of Commerce

Industry:

- Favorable, but not feasible. Ideally, patent should become effective with registration since company has nothing it can sell until that time.
- Favorable, if approach is to obtain full 17 years from registration. However, 25 years would be excessive and monopolistic. Further, patent life of less than 10 years would cause companies to delay registering new products in order to be sure they have "winners" capable of returning their investment within that period.
- Favorable, if patent period begins on the date of first registration for each specific use pattern. Patent life should be less than 17 years, perhaps 10 years from registration for each case.
- Favorable, but doubt that Congress will be receptive.

Environmental Associations:

- Favorable, but would never receive Congressional approval.

EPA-OPP:

- Unfavorable; may be barrier to innovation.
- Favorable; but feasibility of changing patent laws is doubtful.

Other Government Agencies:

- Favorable, but not likely to be received well by Congress.
- Favorable, but not feasible to change patent process.

EPA Project Staff:

- Favorable; but impact on innovation questioned.

ETIP Project Staff:

- Favorable.

ADL Project Staff:

- Feasibility should be examined further.

50. Proprietary Protection for Biological Pest Control and IPM

Encourage commercial companies to develop biological control and IPM methods by protecting (either through patents or the product registration process) R&D efforts and resultant products in the marketplace.

Goals: Encourage companies to devote R&D efforts to biological controls by providing assurance that their efforts and resultant products will be protected in the marketplace.

Action Agents: EPA, Patent Office

Industry:

- Could be favorable; however, this could encourage careless work as companies would rush to get the first application. Also, if one company has control for 17 years, innovative improvements and modifications are discouraged.
- Unfavorable; unpractical; what would be done if another company developed a more effective member of the same strain of biological control?
- Unfavorable; biological controls likely will not be successful; if successful, proprietary positions would be difficult to develop.
- Not feasible. If IPM patents could be developed, they could not be enforced and would be useless.
- Unfavorable, because of favoritism to biological controls and methods over others which are equally safe to people and the environment.

Environmental Associations:

- Favorable; no reasons given.

EPA-OPP:

- Favorable; although legislative barriers likely to be substantial.

EPA-Other:

- There is no real incentive to use (or develop) biocontrols unless they are effective. In area of agricultural products, product quality is a major deterrent to use of biological controls.
- Favorable, but problematic. EPA would have to deal with licensing, royalty and patent problems.

- Unfavorable; large companies would take advantage of this while small companies would not. Comparatively small companies would lose out.

EPA Project Staff:

- Favorable, but Congressional approval unlikely.

ADL Project Staff:

- The proprietary protection for biological controls should be further investigated, but IPM does not lend itself to this type of protection.

51. Commercialization of Pesticide Products Developed by or For the Government

Through more liberal policies for selling and exclusive licensing, facilitate the commercialization by industry of potential products (primarily biological controls) for which the original R&D was accomplished by or under contract to the government.

Goals: Encourage industry to pursue potential products, for which the initial R&D was accomplished by the government.

Action Agents: USDA, EPA, Others

Industry:

- Unfavorable; there is too much dependence on government.
- Favorable and skeptical..."if the government can develop a product, notify them because they will try to sell it."
- Favorable, if it does not focus primarily on biological controls.
- Not a significant incentive because it tends to put government into competition with industry, an unequal and unnatural relationship in many ways.
- Unfavorable; biological control research that could be patentable, should not be developed by EPA or other government agencies.
- Favorable, if products sold to the highest bidder.

Environmental Associations:

- Favorable; no reasons given.

EPA-OPP:

- Favorable; removes risk of development from industry.
- Favorable, but effectiveness questionable due to the scarcity of "significant product ideas."
- Favorable; this is already done for promising products.

EPA-Other:

- Probably not useful for major pesticides, but good for minor pesticides.
- This needs further investigation to determine whether there are enough products developed by the government to warrant major considerations.

Other Government Agencies:

- Possible, although government likely would be seen as subsidizing functions traditionally assigned to industry.
- Favorable, but problematic. Government work should remain in the public domain.
- Unfavorable; would be advantageous to large, but not to small companies.

EPA Project Staff:

- Incentive value is questionable.

ETIP Project Staff:

- May be impractical. This incentive addresses marginal areas which are difficult to assess. The status of rights depends on the product involved.

ADL Project Staff:

- Most of the products developed by the government are not patentable, and thus would not be affected by this incentive.

52. Aggregation of Public Sector Market Demand

Use of the combined purchasing power of all federal agencies (plus possibly state agencies) to encourage the development of new pest control methods.

Goals: Stimulate industry to take risks they would otherwise not take in development of new pest control methods, through use of the government market as a guarantee.

Action Agent: Various government agencies.

Industry:

- Unfavorable; could lead to price control.
- Unfavorable, if "new pest control methods" means "biological controls."
- Acceptable, but will be difficult to implement fairly. EPA would have power to judge what should be encouraged and discouraged.

Environmental Associations:

- Favorable; no reasons given.

EPA-OPP:

- Not an incentive. Public agencies do not use the same type of pesticides used by agriculture.
- Favorable and having incentive value if the use of pesticides is great enough.

EPA-Other:

- Favorable; no reasons given.
- Questionable; such market aggregation can encourage graft and corruption.

Other Government Agencies:

- Potentially workable through GSA, although currently it does not purchase pesticides for government-wide use. Similar in concept to purchasing programs used by GSA for other commodities.
- Unfavorable; each pesticide application is somewhat unique and the type used should be determined on a case-by-case basis.

ADL Project Staff:

- Feasibility of implementation is questionable because:
  1) Coordination of the federal agencies involved would be difficult;
  2) Interaction between the federal and private markets and supplies would require careful monitoring.

53. Aggregation of Government Markets for Pesticides

Variation of above. Stimulate the development of new pest control methods by eliminating price from government procurement performance specifications and by basing specifications solely on criteria such as efficacy, toxicity, and safety.

Goals: Same as for Incentive #52.

Action Agent: Various government agencies.

Industry:

- Not an incentive as the government does not have enough impact in the pesticide market to make any basic difference in pesticide R&D activity.
- Unfavorable; EPA would like to control the pest control practices of all government agencies, particularly promoting IPM. The needs of the agencies vary considerably.
- Unfavorable; elimination of price from government procedure leaves the door open for manipulation and arbitrary judgment regarding efficacy, toxicity and safety.

Environmental Associations:

- Favorable.

EPA-OPP:

- Not an incentive. Public agencies do not use the same type of pesticides used by agriculture.
- Could be an incentive if combined with Incentive #52.

EPA-Other:

- Favorable; no reasons given.
- Questionable; price should be de-emphasized but not eliminated.

Other Government Agencies:

- Potentially workable through GSA, although currently it does not purchase pesticides for government-wide use. Similar in concept to purchasing programs used by GSA for other commodities.
- Unfavorable; price should not be eliminated but only de-emphasized.

ADL Project Staff:

- Incentive value is questionable unless standards and criteria are not oriented to lowest common denominator, as has been the tendency when ASTM and similar bodies have set standards for operation within an industrial sector. Such an orientation will act to minimize and hinder, rather than promote, innovation.

54. Aggregation of Government Markets for Foodstuffs Grown with Desirable Pest Control Methods

Stimulate pest control research and development through inclusion of the pest control methods used during production in the performance requirements for foodstuffs purchased by federal agencies.

Goals: Stimulate development of new pest control products and methods through creation of public consumer demand.

Action Agent: EPA, ETIP, DOD, HEW, V.A., AID, other agencies.

Industry:

- Unfavorable; ridiculous and impractical. This is a promotion for IPM which is not sufficiently developed to deliver quality food to the consumer.

Farm Associations:

- Incentive raises question: should government purchase of foodstuffs be directed toward those food products using pest control methods which produce high quality, lower priced foods, or towards food products suffering greater pest damage, costing more, and yet having caused less environmental damage?

Environmental Associations:

- Would be difficult to implement

EPA-OPP:

- Unenforceable; almost impossible to assure conformity to requirements set.
- Unfavorable; complex and unduly discriminatory against satisfactory chemical pesticides.

EPA-Other:

- Favorable but not feasible; too complicated for government procurement to handle.

Other Government Agencies:

- Not an incentive; government purchases are not sufficiently large to have significant influence on pesticide R&D activities.

ADL Project Staff:

- Government would not be able to define performance standards for safe and effective pest control methods. Any definitions sufficiently agreeable to all agencies concerned would be so innocuous as to have little impact on research and development activities.

55. Influence Pesticide Markets by Education and Food Product Labeling Foodstuffs Grown with "Safe and Effective Pest Control Methods"

Influence pesticide markets by increasing the civilian market demand for foodstuffs grown with certain pest control methods through education programs and mandatory labeling of foodstuffs.

Goals: Stimulate development of new, safe pest control methods through creation of demand in private markets, particularly institutional buyers.

Action Agent: EPA

Industry:

- Unfavorable; the beneficial influence of education cannot be determined.
- Unfavorable; ridiculous and impractical.
- Favorable; but conflicts with current EPA philosophy of not allowing safety claims on labels. Industry has been unsuccessful in the past in gaining USDA and EPA favor for this.

Environmental Associations:

- Favorable; particularly with currently established trend of public paying more for organic foods.

EPA-OPP:

- Unenforceable; too complex.
- Unfavorable, frequently not practical to isolate foods produced under certain conditions.
- Favorable; could have tremendous impact as an incentive... particularly given current public awareness of the possible effects of residues in foods. However, food itself would have to be cost competitive.

EPA-Other:

- Favorable, but likely too complicated unless good criteria established for labeling.
- Not practical; requires too much consumer education.

ADL Project Staff:

- Difficult to define safe and effective; also, would increase cost of food.

56. Government Performance of Market Analyses

Reduce uncertainties concerning long-term markets for pesticide products by government analysis of markets, competing products and processes, and prospective public regulations.

Goals: Reduce market uncertainties for pesticide producers through market analyses performed by the government.

Action Agent: EPA, USDA, private contractors.

Industry:

- Unfavorable; industry can analyze markets much faster and more efficiently than can government.
- Unfavorable; government could not do a good job as shown by EPA's economic impact analyses on cancellations, suspensions and regulations.
- Favorable, depending on implementing agency. USDA or the Department of Commerce would be acceptable; EPA would not be acceptable.

Environmental Associations:

- Favorable; particularly would help small companies with market analysis.

EPA-OPP:

- Not an incentive. Government analysis would be no more accurate than private industry analysis of markets...would not help reduce uncertainties.
- There is a need for EPA to release to the public aggregated data obtained under Section 7, particularly since the tariff commission data no longer will be published.

EPA-Other:

- Unfavorable; private sector can do this better than public sector.

Other Government Agencies:

- Unfavorable; no need for government to do this.

ADL Project Staff:

- Government should not be involved in marketing activities.

57. Subsidies or Price Support for Crops Raised with Desired Pest Control Products or Methods

Provide direct subsidies or crop price guarantees for private users of integrated pest management and other innovative and safe pest control methods.

Goals: Stimulate private users to utilize IPM and other innovative, efficacious and safe pest control method.

Action Agent: EPA, USDA

Industry:

- Unfavorable; this amounts to trying to pay farmers to use less effective pest control methods.
- Unfavorable and impractical; safe cannot be adequately defined.

Farm Associations:

- Unfavorable; this does not allow for regional variations of agricultural production of any given crop. Further, "safe pest control methods" needs further definition.

EPA-OPP:

- Unfavorable; difficult to implement. Criteria, proof, enforcement systems needed to prevent fraud.
- Favorable; has strong value as an incentive.

EPA-Other:

- Unfavorable; insurance is a better mechanism than subsidy.
- Favorable; would promote non-chemical pest control methods.

Other Government Agencies:

- Unfavorable; subsidies are not practical.

ADL Project Staff:

- The following areas need definition:

  1) a system to prevent misuse of subsidies for profit from farmers,
  2) boundaries for selecting pesticides and crops eligible for subsidies,
  3) an appropriate level of subsidy which will be lower in cost than other control methods used by farmers.

58. Expansion of Extension Service Program

Stimulate user demand for effective and safe products and methods by use of State Extension agents to assist with the informed selection and use of pest control methods.

Goals: Stimulate private users to utilize IPM and other innovative, efficacious and safe pesticides.

Action Agent: EPA, USDA

Industry:

- Interesting, but impractical.
- Not necessary. Farmers are quite satisfied with services they are getting now.
- Favorable, if done through USDA with purpose of providing more and better information to county agents. Incentive influence would be minor.
- Favorable because this involves strengthening an existing organization that has already proven its effectiveness and usefulness.

Environmental Associations:

- Reform of Extension Service is needed more than expansion. (No reforms suggested.)

EPA-OPP:

- Favorable; should already be in operation via USDA.

EPA-Other:

- Favorable provided such an effort is not too costly. Further, extension service is already quite effective; hence specific changes needed should be determined. One suggested change is an environmental staff person in the service offices.

Other Government Agencies:

- Favorable; using existing mechanism of the Extension Service is a good idea. Further, current effectiveness of the Service is in question. Its role and capabilities should be further defined and augmented.

ADL Project Staff:

- Favorable, if implemented in coordination with current USDA programs.

59. Increase Foreign Markets for U.S. Pesticide Products and Processes

Initiated by EPA, explore foreign markets for safer and more effective pest control methods developed in the U.S. Eventually expand the market for these products.

Goals: Stimulate foreign markets for U.S. pesticide products and processes.

Action Agent: EPA, USDA.

Industry:

- Impractical; foreign governments increasingly have and favor their own regulations. Further, USDA is already exploring foreign markets fairly effectively.
- Unfavorable, impractical; IPM is not competitive here, nor will it be abroad.
- Favorable, but EPA should not be the administering agency.

Environmental Associations:

- Favorable; should be implemented in conjunction with the State Department, USAID, the Peace Corps, etc.

EPA-OPP:

- Favorable, but should not be administered by EPA.
- Unfavorable; current industry efforts are sufficient. Further, EPA should not be involved in marketing.

EPA-Other:

- Unfavorable; IPM has problems here and these will remain in exporting.
- Favorable; needs further exploration.

Other Government Agencies:

- Unfavorable; not an incentive for pesticide R&D development.

ADL Project Staff:

- Favorable, if implemented in coordination with current U.S. programs in foreign countries.
- Unfavorable; EPA should not be involved with marketing activities.

60. Expansion of the Number and Role of Independent Pest Management Consultants

With USDA or EPA support, increase the number and role of pest management consultants; also develop total performance pest management service organizations in order to aid the farmer and influence pest management practices.

Goals: Aid creation of a new "business," designed to promote sale of pest management.

Action Agent: Private industry, EPA.

Industry:

- Favorable, if IPM is not a required part of the program, and expense to taxpayers should be minimized.
- Unfavorable, with government agencies such as EPA or USDA involved. The private sector will develop the needed quantity and quality of services. Government support threatens the independence and integrity of pesticide salesmen.
- Favorable, if USDA or small business administration, not EPA, is administering agency.

Environmental Associations:

- Favorable; no reasons given.

EPA-OPP:

- Favorable, if run by USDA, not EPA.

EPA-Other:

- Favorable if administered by the Small Business Administration, not EPA or USDA.
- Favorable; role of independent pest management consultants can be very effective in giving farmers useful information.

Other Government Agencies:

- Unfavorable; the private sector will generate need for pest management consultants and services. USDA/EPA role should be one of information transfer, that is letting people know what is available.

ADL Project Staff:

- Unfavorable because:

  1) the independent consultants would be in direct competition with Extension Service agents and would be more expensive than Extension Services. It is doubtful that they could provide sufficiently superior service to convince farmers to pay the increase.
  2) the number of potential products involved is small and existing industrial marketing and distribution chains are adequate for current demand.

61. Safety Index

Include safety index on pesticide labels to enable consumers to compare relative safety characteristics of the available pesticides.

Goals: Allow consumer to determine the relative safety of products.

Action Agent: EPA

Industry:

- Favorable, particularly for household products.
- Unfavorable; there are too many variables, particularly the difficulty in defining safety. The hierarchy of safety-related terms which already exists is not recognized or understood by most customers.
- Favorable, only to the extent of supporting use of restricted and unrestricted on the label as an indication of safety.
- Unfavorable; there is already sufficient information regarding human and environmental effects on the label.
- Favorable but will be difficult to implement. USDA and EPA have rejected similar attempts in the past.

Environmental Associations:

- Favorable; labels should be organized around a color scheme based on toxicity.

EPA-OPP:

- Favorable, even if it does not encourage new products. Although it may be difficult to agree on criteria, it is useful to make the consumer more aware of pesticide problems.
- Favorable; a safety index would be more useful than an environmental index.
- Unfavorable; criteria for indices are very difficult to define. Environmental groups likely would present many challenges.

Other Government Agencies:

- Favorable, but difficult to implement.

EPA Project Staff:

- Favorable, if differences between EPA and industry can be worked out.

ADL Project Staff:

- Goal is desirable, but implementation mechanism needs to be examined further.

62. Independent Pesticide Broker

Establish an independent organization to buy and sell information and data on existing and potential pesticides; rights and licenses to specific products; and other information on products, uses, and application.

Goals: Aid individuals and companies in obtaining information (for use in further development and/or registration) on possible pesticide products that are of little interest to the original developer but which may be of significant interest to others.

Action Agent: An independent federally chartered organization.

Industry:

- Favorable; would be useful to formulators. Could be difficult to implement.
- Unfavorable; not needed.

EPA-OPP:

- Has little incentive value; difficult to implement.

EPA-Other:

Impractical; if implemented, EPA should not be involved.

EPA Project Staff:

- Favorable if mechanism can be developed and if there is enough demand for a product dropped by companies.

ADL Project Staff:

- Such an organization or service should be initiated by the private, not the public, sector. Government sponsorship would have little chance of success because there would be great reluctance by industry to transmit valuable information.

63. Collaborative Industrial Efforts

In order to encourage collaborative R&D by companies on new, high-risk innovative products, eliminate any regulatory or legal barriers and, if necessary, provide economic incentives for such effort.

Goals: Enable industrial organizations to undertake, on a collaborative basis, R&D on new high-risk innovative products that no single organization could or would be willing to finance or conduct.

Action Agent: Federal government.

Industry:

- Unfavorable; impractical. Collaborative efforts will occur if commercial interest exists, whether incentives are there or not. Philosophy is against our free-enterprise, competitive system.

Environmental Associations:

- Favorable; small companies may need this and benefit from it.

EPA-OPP:

- Impractical; companies collaborate to the extent they desire; going further likely will result in collusion.

EPA-Other:

- Ineffective; contrary to free enterprise.

Other Government Agencies:

- Impractical; industry not likely to be interested. This amounts to splitting profits.

EPA Project Staff:

- Interesting, but has little incentive value.

ETIP Project Staff:

- The more product-related the research, the less acceptable the ideal. Has little incentive value.

ADL Project Staff:

- Impractical, unlikely that industry desires to cooperate.

64. A Pesticide Development Award

Establish a prize/award to be given by EPA each year for the outstanding innovative pesticide development.

Goals: Encourage innovative development by industry.

Action Agent: EPA

Industry:

- Favorable, but unrealistic. Will not help the pesticide industry as such, but might help people in academia.

- Unfavorable; companies do not need such awards. Their award is profit and company freedom. Further, it is likely to be politically motivated, particularly if EPA selects the recipient of the award.

Environmental Associations:

- Has little incentive value for industry.

EPA-OPP:

- Has little incentive value for industry; could provide an incentive for individuals. Should not be administered by EPA.

- Favorable; there should be an award for each major area of pesticides.

EPA-Other:

- Has little incentive value.

Other Government Agencies:

- Unfeasible; EPA cannot define criteria for such an award.

EPA Project Staff:

- Has little incentive value.

ETIP Project Staff:

- Has little incentive value.

ADL Project Staff:

- Can recognize individual effort, but has little incentive value for new product development.

APPENDIX K

RELATIVE RANKING OF INCENTIVES BY GOVERNMENT AGENCIES AND ASSOCIATIONS

		Incentive Number																		
	AGENCY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1.	EPA-OPP	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.	EPA-OPP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-
3.	EPA-OPP	-	-	1	-	1	-	3	-	4	-	4	2	-	-	-	-	-	-	3
4.	EPA-OPP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	3
5.	EPA-ORD	3	3	3	3	3	3	-	-	4	-	-	3	-	3	-	2	1	1	0
6.	EPA-Office of Plan. & Eval.	1	3	-	-	-	1	-	-	3	-	3	-	-	-	-	4	-	4	-
7.	EPA-Agric. Asst. to EPA Admin.	2	2	-	-	-	2	3	3	4	3	3	1	-	-	-	-	-	-	-
8.	Dept. of Commerce	3	3	-	0	0	3	4	0	0	0	0	0	0	4	0	0	0	0	4
9.	U.S. Senate Agric. Comm.-Senate Rvw.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	2
10.	U.S. House-Agric. Comm.	0	3	-	-	-	0	4	-	4	-	3	-	-	-	-	2	-	1	-
11.	General Services Admin.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.	OGC	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	3	3
13.	Amer. Farm Bureau Fed.	3	-	-	-	0	3	3	-	-	-	-	1	1	-	-	-	0	-	1
14.	EDF	1	1	1	1	1	2	2	4	0	1	3	-	3	3	3	3	3	1	3

CODE: 0 Can't abide or "live with" incentive
1 Unfavorable toward incentive
2 Neutral (or not necessary) toward incentive
3 Agreed with, but not optimistic about, incentive
4 Strongly support incentive
blank No opinion or comment obtained

RELATIVE RANKING OF INCENTIVES BY GOVERNMENT AGENCIES AND ASSOCIATIONS

AGENCY	Incentive Number																
	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1. EPA-OPP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
2. EPA-OPP	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
3. EPA-OPP	4	0	-	-	3	-	0	4	-	-	-	-	4	3	-	-	-
4. EPA-OPP	3	0	1	3	-	1	1	1	-	0	-	-	3	1	-	-	-
5. EPA-ORD	2	0	1	1	1	1	1	1	1	1	4	3	3	3	-	2	2
6. EPA-Office of Plan. & Eval.	3	-	-	1	1	-	-	-	-	4	-	-	-	-	1	3	-
7. EPA-Agric. Asst. to EPA Admin.	4	0	-	-	-	-	-	-	-	-	-	-	-	-	3	2	3
8. Dept. of Commerce	3	0	1	1	3	3	0	1	2	4	1	0	1	0	2	4	3
9. U.S. Senate Agric. Comm.-Senate Rvw.	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
10. U.S. House-Agric. Comm.	1	-	-	3	-	-	-	-	-	-	-	-	-	-	2	-	-
11. General Services Admin.	-	-	-	-	3	-	-	4	-	-	-	-	-	-	-	-	-
12. OGC	3	2	-	-	-	-	-	0	3	0	-	-	-	-	-	1	-
13. Amer. Farm Bureau Fed.	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
14. EDF	-	3	1	1	0	3	3	3	3	3	3	3	3	3	3	3	-

RELATIVE RANKING OF INCENTIVES BY GOVERNMENT AGENCIES AND ASSOCIATIONS

		Incentive Number														
	AGENCY	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
1.	EPA-OPP	3	4	4	-	-	-	-	-	-	-	-	-	-	-	-
2.	EPA-OPP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.	EPA-OPP	3	-	-	-	-	1	-	-	-	0	-	0	4	4	3
4.	EPA-OPP	-	-	-	-	-	-	-	-	-	0	3	3	-	-	-
5.	EPA-ORD	-	3	0	4	3	3	3	3	3	0	3	3	0	-	1
6.	EPA-Office of Plan. & Eval.	-	1	4	4	3	0	3	3	1	0	-	-	3	3	3
7.	EPA-Agric. Asst. to EPA Admin.	-	-	-	-	-	-	-	-	-	0	0	0	-	-	2
8.	Dept. of Commerce	3	0	4	0	1	2	2	2	0	0	0	0	0	3	3
9.	U.S. Senate Agric. Comm.-Senate Rvw.	-	-	-	-	1	-	-	-	-	-	-	-	2	2	2
10.	U.S. House-Agric. Comm.	-	-	-	2	1	1	-	-	2	-	-	-	-	0	0
11.	General Services Admin.	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-
12.	OGC	-	-	-	-	-	-	-	-	-	4	3	3	2	-	-
13.	Amer. Farm Bureau Fed.	-	0	0	-	4	1	-	-	-	0	0	0	-	-	-
14.	EDF	4	1	1	1	1	1	3	3	3	4	3	1	4	4	4

RELATIVE RANKING OF INCENTIVES BY GOVERNMENT AGENCIES AND ASSOCIATIONS

	Incentive Number												
AGENCY	52	53	54	55	56	57	58	59	60	61	62	63	64
1. EPA-OPP	-	-	-	-	-	-	-	-	-	-	-	-	-
2. EPA-OPP	-	-	-	-	-	-	-	-	-	-	-	-	-
3. EPA-OPP	-	-	1	1	2	2	3	2	-	-	2	-	-
4. EPA-OPP	-	-	-	-	-	-	-	-	-	-	-	-	-
5. EPA-ORD	4	4	3	4	0	1	3	0	3	0	3	0	2
6. EPA-Office of Plan. & Eval.	1	1	0	0	-	0	4	3	3	4	-	4	0
7. EPA-Agric. Asst. to EPA Admin.	1	-	-	-	-	-	3	-	4	3	-	-	3
8. Dept. of Commerce	0	1	0	0	0	1	4	0	3	4	0	1	3
9. U.S. Senate Agric. Comm.-Senate Rvw.	-	-	-	-	-	-	-	-	-	-	-	-	-
10. U.S. House-Agric. Comm.	4	-	-	-	-	-	4	-	-	-	-	-	-
11. General Services Admin.	3	3	-	-	-	-	-	-	-	-	-	-	-
12. OGC	-	-	-	-	-	-	-	-	-	-	-	-	-
13. Amer. Farm Bureau Fed.	-	-	-	-	-	1	-	-	-	-	-	-	-
14. EDF	-	4	3	3	4	-	3	2	-	4	1	3	3

APPENDIX L

RELATIVE RANKING OF INCENTIVES BY INDUSTRY

COMPANY	Incentive Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	-	-	-	-	-	-	0	-	4	0	0	0	0	0	0	0	0	0	4
2	0	0	0	0	0	0	3	0	4	0	2	2	2	2	2	3	0	2	3
3	3	3	-	4	-	-	3	2	3	-	-	-	-	-	-	4	4	1	4
4	0	0	3	0	0	1	3	2	4	1	0	-	0	2	0	0	0	0	4
5	-	-	-	-	-	-	-	-	0	-	1	3	-	-	-	-	-	-	4
6	1	1	1	1	1	1	3	-	4	2	1	1	-	4	3	3	2	3	3
7	1	1	1	1	0	2	2	4	4	1	1	0	1	2	1	3	1	1	4
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	4
9	1	1	4	1	1	1	3	-	2	-	-	-	-	-	-	1	1	3	2
10	1	1	3	4	2	1	0	3	4	3	0	0	3	3	4	4	3	0	4
11	-	-	-	-	-	-	4	1	4	4	3	2	1	1	1	3	-	-	4

CODE:

0	Can't abide or "live with" incentive
1	Unfavorable toward incentive
2	Neutral (or not necessary) toward incentive
3	Agreed with, but not optimistic about, incentive
4	Strongly support incentive
blank	No opinion or comment obtained

RELATIVE RANKING OF INCENTIVES BY INDUSTRY

COMPANY	Incentive Number 20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1	4	0	1	0	1	1	1	1	1	1	1	1	1	1	1	3	2	2	2	2	0	3	1
2	4	0	0	0	0	0	0	0	0	2	0	0	0	0	0	3	2	2	-	-	0	0	0
3	4	0	0	3	3	1	0	0	0	0	3	3	3	-	1	3	1	-	-	-	3	3	3
4	4	0	2	2	2	0	0	1	0	0	1	0	3	0	2	3	2	2	0	-	0	3	0
5	4	0	1	1	1	1	1	1	1	1	1	1	3	1	1	-	2	-	-	3	0	1	1
6	4	1	-	3	-	-	-	-	-	3	-	-	-	-	4	3	1	2	-	-	4	4	0
7	4	0	2	3	3	3	0	2	3	1	0	0	0	0	3	3	3	0	0	1	0	3	3
8	4	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	3	3	3	2	2	2	0	-	0	1	3	1	-	0	1	1	-	-	-	-	-	2	-
10	4	0	3	3	3	0	0	4	2	4	0	0	2	0	3	3	4	0	0	4	0	3	0
11	4	4	-	-	0	-	-	-	-	0	0	0	0	0	0	3	-	-	-	-	-	3	-

RELATIVE RANKING OF INCENTIVES BY INDUSTRY

	Incentive Number																					
COMPANY	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
1	1	1	1	0	0	-	3	-	-	-	0	0	0	0	-	2	-	-	-	-	-	-
2	1	0	0	0	0	0	4	2	2	2	2	2	2	2	2	3	-	0	2	0	0	2
3	-	4	3	-	0	1	3	-	3	1	-	-	-	-	-	-	-	-	-	-	-	4
4	1	0	0	0	0	0	4	2	3	0	0	0	2	0	0	2	2	2	2	0	0	0
5	-	-	-	0	0	0	4	1	-	0	-	-	-	-	-	3	2	3	0	-	0	0
6	0	0	0	2	2	2	3	2	1	-	-	-	-	-	-	-	-	2	3	-	3	-
7	3	3	1	0	0	0	4	1	0	1	0	1	0	0	0	1	0	1	0	1	1	0
8	-	-	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	2	-	-	-	-	3	-	-	-	-	0	-	-	-	-	-	-	-	-	-
10	3	4	4	0	0	0	4	0	2	2	0	0	3	3	0	3	3	3	4	-	0	3
11	-	-	-	0	0	0	4	3	4	1	1	-	-	-	-	-	-	3	1	-	-	-

APPENDIX M

AVERAGE RANKINGS OF INCENTIVES*

Incentive No.	Industry	Government and Associations
1	1.0	1.9
2	1.0	2.6
3	2.0	1.7
4	1.6	1.3
5	0.7	1.0
6	1.0	2.0
7	2.3	2.9
8	2.0	2.3
9	3.3	2.9
10	1.6	1.3
11	1.0	2.4
12	0.8	1.3
13	1.4	1.7
14	2.0	3.3
15	1.6	1.5
16	2.2	1.6
17	1.3	1.1
18	1.2	1.5
19	3.6	2.7
20	3.9	2.9
21	0.8	0.7
22	1.4	1.0
23	1.9	1.7
24	1.7	1.8
25	1.9	2.2
26	0.3	1.0
27	1.3	2.0
28	0.9	2.3
29	1.3	2.0
30	1.9	2.0
31	0.7	2.0
32	1.3	2.8
33	0.3	2.0
34	1.5	2.2
35	2.8	2.4
36	2.1	3.0
37	1.3	3.3
38	0.5	1.5
39	2.5	2.2
40	0.9	2.2

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*Obtained by dividing the sum of relative rankings by the number of responses in each category.

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Incentive No.	Industry	Government and Associations
41	2.5	2.0
42	1.0	1.3
43	1.5	2.8
44	1.7	2.8
45	1.4	1.8
46	0.3	0.9
47	0.2	1.6
48	0.4	1.2
49	3.6	2.1
50	1.8	2.7
51	2.1	2.3
52	1.0	2.2
53	0.5	2.6
54	0.6	1.4
55	1.2	1.6
56	1.0	1.5
57	0.5	1.0
58	2.3	3.4
59	1.8	1.4
60	2.0	3.3
61	1.7	3.0
62	0.3	1.5
63	0.7	2.0
64	1.5	2.2

APPENDIX N

INCENTIVE SUGGESTIONS FROM INDUSTRY, GOVERNMENT, AND ASSOCIATION STAFF CONTACTED DURING REVIEW OF "INTERIM WORKING DOCUMENT"

Incentives

1. Facilitate better communication between industry and EPA, through a vehicle such as the Research Directors Committee of the National Agricultural Chemical Association
2. Decrease power of the office of General Counsel to override scientific rationale
3. Implement a statutory time limit for EPA's response concerning the temporary registration
4. Create a new registration category for materials that present no threat to human safety and may be used on minor crops at the risk of the applicator
5. Waive the liability, including listing on the label, for minor crops listed under IR-4
6. Allow companies to advertise safety by creating a "safe" category and/or by removing the caution from category 4 products
7. Apply USDA or EPA research resources to safer, innovative pesticides, not restricted to minor crops and including efficacy testing
8. Implement "self registration" whereby the manufacturer certifies that the product complies with stated specifications
9. Legislate time limits for decision making by EPA
10. Eliminate government involvement in the search for and development and marketing of pest control products
11. EPA publicize need for benefits and advantages of chemical pest control rather than maintain a consistently critical and negative view of pesticides
12. EPA develop guidelines, establishing reasonable parameters for pesticide development
13. Institute crop grouping for purpose of establishing residue tolerances
14. Expedite issuance of experimental use permits

15. Allow inclusion of IR-4 crops in registration requiring minimal corporate investment

16. Establish negligible (rather than finite) residue tolerances

17. EPA allow for greater use of data waiver in registration procedures

18. Shorten EPA time for product data review, through data waiver, for example

19. Extend patent protection, by beginning it at time of use approval

20. Develop different review protocols for "safer" chemicals

21. Increase manpower for and competency of EPA staff engaged in review

22. EPA provide accurate estimate of time of review completion

23. Involve panel of reviewers in specific section of review, e.g., toxicology

24. Enable informal discussion between company and reviewer concerning disputed conclusions

25. Complete application as additional requested data becomes available, rather than dropping application to bottom of review list

26. Sell or license product to USDA for minor crop registration

27. Create a National Pesticide Training Center

28. Expedite use permits for critical areas of need

29. Government support work on protocols and test methods for registration

30. Implement provisional registration or changes in the experimental permit system to facilitate data collection

31. Eliminate tolerance fee

Suggestions:

1. Reasonable and well thought out regulations taking into account industry's data, views, and experience

2. Development of an honest, objective risk-benefit approach reflecting more than the views of EPA

3. Abolish concept of 100% safety

4. In designing incentives, find a balance between short-range benefits and short-range costs as a strategy for gaining Congressional approval.

5. Extend risk protection to the end user but not the pesticide producer.

6. Develop a practical rather than academic approach to data review by EPA

7. Provide motivation for lower-level EPA staff to work toward "real progress."

8. Inform EPA staff of the "realities" of the pesticide business

APPENDIX O

THE APPROPRIATENESS OF INCENTIVES IN ALTERNATIVE FUTURES

1. BASIS FOR ANALYSIS

In 1974, the Center for the Study of Social Policy of Stanford Research Institute (SRI) was awarded a contract by EPA to develop a series of scenarios of alternative futures and recommendations for the use of the alternative futures method in the EPA planning process.[1] Ten scenarios were developed, each representing a plausible alternative future for the coming 25 years. The scenarios were developed not in an attempt to predict the future, but to use as a basis for contingency planning by EPA and to place some bounds of the uncertainty in the future. The scenarios are described by several "driving trends" and their variation over time--energy and its growth rate, climate, personal and social values, and food price and availability. The scenarios cover variations on three major themes:

- Industrial success with no major value or institutional changes from the present
- Industrial distress resulting in social, economic and political anxiety and instability
- Industrial transformation exemplified by the adoption of "frugal" values, involvement of more people in self-sustaining activities, and development of new social and economic institutions.

After developing these scenarios and exploring their basis and variations, SRI staff presented and tested a methodology that could be used to systematically explore the policy implications of these future scenarios for EPA. The method consisted of presenting policy issues in such a way that they could be answered by a "more/less" or "increase/decrease" response. The acceptance or effect of the policy issues at some time in the future considered with respect to any scenario could then be compared to the understanding of present attitudes or perceptions of effect. Following this approach, a cross scenario analysis could be made for each issue, or all issues could be examined with relation to specific scenarios. The method allows examination of a number of issues over time in a variety of plausible future scenarios.

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[1] Alternative Futures for Environmental Policy Planning: 1975-2000, Stanford Research Institute, D.S. Elgin, D.C. MacMichael, P. Schwartz, EPA-540/9-75-027, October 1975.

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With the guidance of the EPA project officer (who had also been project officer for the SRI work) we experimented with the use of the SRI developed methodology to examine the potential acceptance and impact of five incentive actions--lengthen patent life, fund basic research, advertise safety, encourage IPM, and improve the registration process--and the EPA/ETIP project over the time frame 1980-2000, considering the prevailing conditions and three scenarios taken from the SRI work. The questions were posed: "Will acceptability of the incentive within the subset of society that includes pesticide R&D and production industries, EPA, Congress and the user community be greater or less than at present?" "Would the EPA/ETIP project on incentives and its objectives have more/less acceptance (or impact) than at present?" The three scenarios we considered are described briefly in Figures O-1, O-2, and O-3. These three most clearly exemplify the themes mentioned above. Other scenarios display these themes in a less extreme fashion and could have been chosen. However, we felt the clarity of these three was useful for our experiment. Although these figures are self-explanatory, we have presented the definitions of these driving values taken from the SRI report in Table O-1 to assist in their interpretation.

In an all-day meeting, six ADL and one EPA staff member considered these incentives and developed a consensus on the acceptance and impact. (In preparation for the meeting, each participant had read the incentive actions, the SRI report, the scenarios, and the methodology.) There was only modest disagreement during the discussion, and a consensus was reached on most issues. Table O-2 summarizes the process.

The group assigned a symbol to represent its judgment on each of the questions. The symbols used and arbitrary scoring numbers assigned, were:

Substantial increase	↑↑	+ 2
Moderate increase	↑	+ 1
No change from present	↔	0
Moderate decrease	↓	- 1
Substantial decrease	↓↓	- 2
Split with society	↑/↓	0
Reversal between time periods	*	

B. RESULTS

Table O-3 displays the results of this process when the acceptability of the incentives was examined. Table O-4 does the same for the impact of the incentives, and Table O-5 shows the results for the program objectives. An asterisk was used to denote when a

FIGURE 0-1

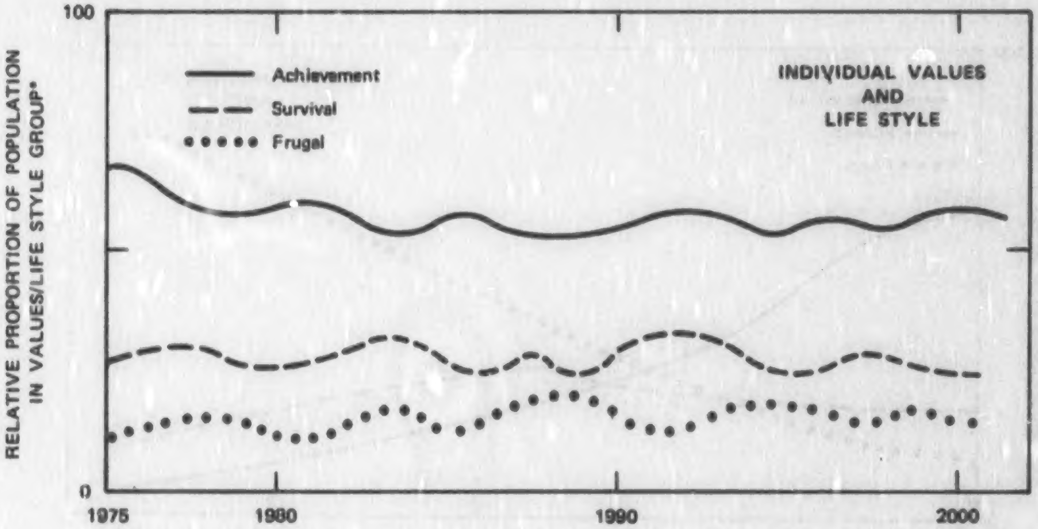
"SUCCESS" SCENARIO

SCENARIO 1

"HITTING THE JACKPOT"

Summary

Basically, this is the Kahnian future. Science produced the answers; nature was kind; wise corporate business leadership acted responsibly; government stayed out of the way. The present time of troubles was merely a temporary aberration on the long term multi-fold trend line. The general, increasing, and more widely extended level of prosperity during the 25-year period placed no excessive strain on the environment: the prosperity of the period enabled the repair of whatever minor damage was done. By 2000 the highly complex and interdependent world economic system demanded a form of world government, and this same system increasingly demanded and established world rules for regulation of the environment.



	1980	1990	2000
ENERGY	continued high growth	continued high growth	continued high growth
CLIMATE	favorable	favorable	favorable
FOOD	moderate price, no shortage	moderate price, no shortage	moderate price, no shortage

*The values/life style graph is not meant to be a precise description of population in each life style/values group; rather it is only intended to be illustrative of the changing pattern of life-styles and values.

FIGURE 0-2

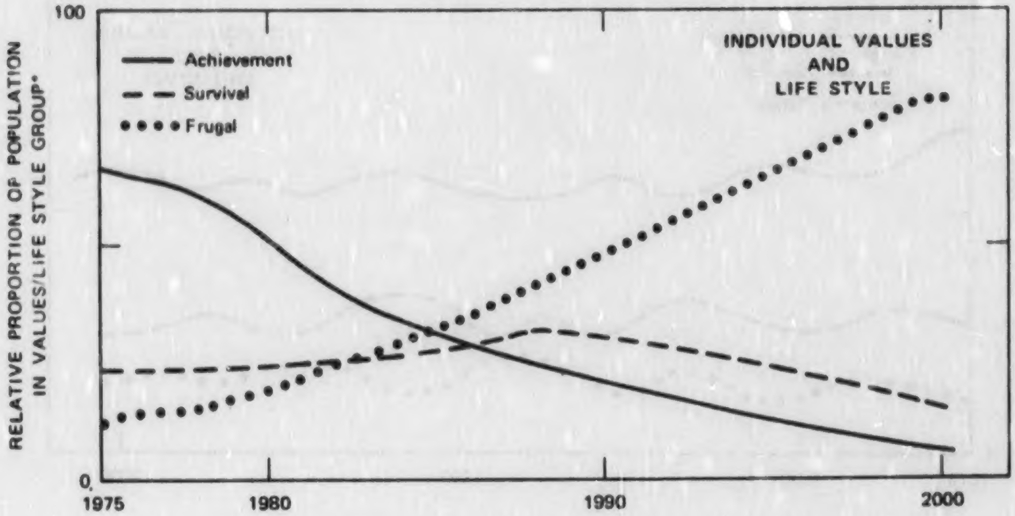
"TRANSFORMATION" SCENARIO

SCENARIO 4

"JOURNEY TO TRANSCENDENCE"

Summary

This scenario is the story of evolution and transformation. The old, growth-dependent order slowly eroded as it faced the limitations of a finite earth. From the late 1970's to the early 1990's the leadership doggedly persisted in trying to make the "American Dream" work but with diminishing success. A new order, guided by a more humane image of man, slowly emerged in the midst of the decay of the old. With ever increasing success its adherents learned how to translate its aspirations into practical realities. At the turn of the century the visible success of this new frugal sector had drawn most of the remnants of the old order to its side.



	1980	1990	2000
ENERGY	controlled growth	controlled growth	zero or declining growth
CLIMATE	variable	variable	variable
FOOD	high price, no shortage	high price, shortage	high price, no shortage

FIGURE O-3

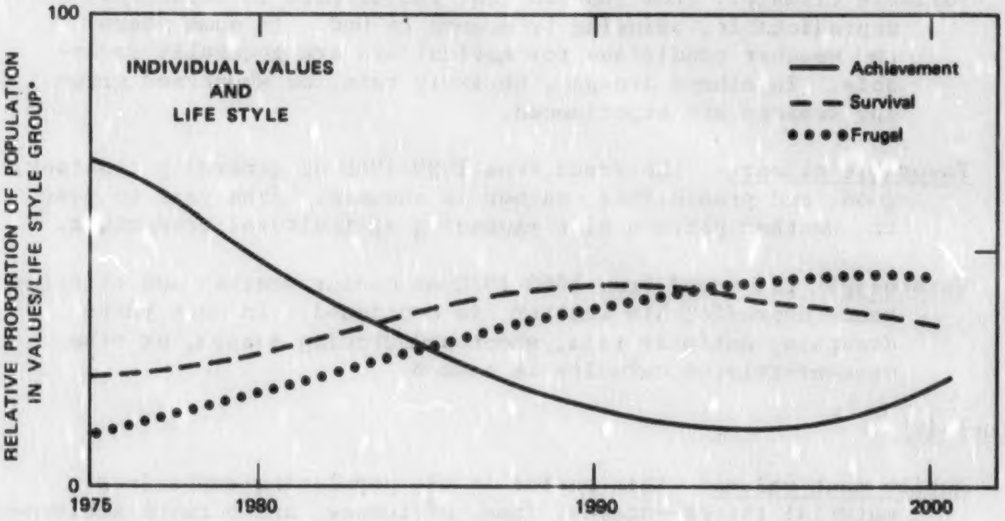
"DISTRESS" SCENARIO

SCENARIO 8

"THE DARK AT THE TOP OF THE STAIRS"

Summary

In the late 1970's, efforts to control the demand for energy brought on a decade-long recession. By 1990, people learned to live with reduced levels of energy consumption. However, this was accomplished through the gradual withering of the industrial state and the slow, grudging acceptance of more frugal life styles. In the 90's the climate turned for the worse, pushing energy consumption up and the standard of living even lower. The end of the century marked the free market industrial world with near exhaustion, economic stasis and pessimism but with social peace, enforced by authoritarian regimes. Socialist industrial countries, better prepared by experience for these conditions, were little better off, but did not share the sense of trauma and defeat. Third world countries were left to their own resources and displayed a variety of social and economic conditions. Some were materially better off. Others, especially Latin American and African dependencies of the industrial nations, simply relapsed into primitive conditions in which cities became Calcuttas and the countryside reverted to primitive agriculture.



	1980	1990	2000
ENERGY	controlled growth	controlled growth	continued high growth
CLIMATE	variable	variable	worsening
FOOD	high price, no shortage	high price, shortage	high price, shortage

TABLE O-1

DEFINITIONS OF DRIVING TRENDS

Energy (E)

Continued high growth: the historical trend of high growth (rate = 4%) in energy consumption is continued.

Controlled growth: the growth rate in energy consumption is controlled by design and slowed (rate ≃ 1-3%).

Unsuccessful high growth: the continued high growth in energy consumption is disrupted by severe supply problems and a rapid net decline is experienced.

Zero or declining growth: the growth rate in energy consumption is leveled out (rate ≃ 0- -1%).

Climate (C)

Variable climate: from year to year the climate is relatively unpredictable, swinging from good to bad. In some years the weather conditions for agriculture are generally favorable. In others drought, untimely rain, or shortened growing seasons are experienced.

Favorable climate: the trend from 1890-1960 of generally constant, good, and predictable weather is resumed. From year to year the weather pattern aids expanding agricultural production.

Worsening: the trend from 1960-1970 of cooler weather and shifting hence unpredictable weather, is continued. In most years droughts, untimely rain, shortened growing season, or other weather-related calamity is common.

Values (V)

Achievement values: this sector of the population emphasizes material things--status, fame, affluence, and outward achievement--on the personal level; and growth, bigness, competition on the system level. Other descriptions of values congruent with this sector include: mechanistic, materialistic, individualistic, secular, centralized, scientific, empirical.

Survival values: this sector embraces the values of the achievement sector as described above; however, the material circumstances are such that these values cannot be readily realized. The consequences are frustration, dogged endurance, emphasis upon security and survival aspects of achievement values, etc.

TABLE 0-1 Continued

Frugal values: emphasis in this group is upon voluntary simplification of the exterior aspects of life in order to attain greater richness of inner aspects. Coupled with the foregoing are two other dominant values: a self-realization ethic which asserts that each person's proper goal is the evolutionary development of his fullest human potential; and an ecological ethic which asserts that the Earth is limited, recognizes the underlying unity of the human race, and perceives man as an integral part of the natural environment.

Survival/frugal split: this is a values pattern which emerges when the dominant achievement sector is substantially reduced to a small minority by adverse economic circumstances and leaves two divergent modes of responding; importantly, the nature of the response of these two groups is often nearly identical but the motivation (premised upon values) is often quite different; e.g., survival folks would consume less gasoline because they were forced to by high prices; frugal folks would consume less because they were forced to and because they wanted to consume less, given their values orientation.

Trimodal split (achievement, survival, frugal): this values grouping assumes that there is no single dominant values sector in society; rather, the values are split among the three groups.

Achievement/frugal split: the values are split predominantly among the two groups along the values dimensions as characterized for each above.

Achievement/survival split: the values are split predominantly between these two groupings along the dimensions described for them above.

Food (F)

High prices for food/no food shortage: a number of forces can combine to create a "high" price without a food shortage; e.g., higher energy prices, a moderate degree of adverse climatological change, export of food to enhance balance of payments, more food demanded due to population growth domestically and/or abroad, greater proportion of indirect consumption of protein, greater proportion of food consumed with technological input--so-called "convenience foods," and so on.

Table O-1 Continued

Moderate food price/no shortage: this condition assumes that the supply and demand factors discussed above do not individually or collectively "conspire" to create high prices and/or shortages.

High food price/food shortage: this assumes that some combination of adverse circumstances--domestic and/or international--creates a condition where there is both high food prices and chronic food shortages.

TABLE 0-2

SCENARIO/INCENTIVE EVALUATION PROCESS

Incentives

- Fund Basic Research
- Advertise Safety (on label)
- Improve the Registration Process
- Encourage Integrated Pest Management (IPM)
- Extended Patent Life

Examine via these questions:

- Will the acceptability of the incentive within the subset of society that includes the pesticide R&D and production industries, EPA and USDA, Congress and the user community be greater or less than at present?
- Will the impact of the incentive be greater or less than at present?

Overall Objective:

- Operate a program of incentives to promote innovation in pest control

Sub-Objectives:

- Alleviate barriers to innovation caused by regulatory problems, and
- Promote safer biologically integrated pest controls

Examine via this question:

- Will the objectives be seen to be more or less appropriate and acceptable by society as a whole than at present?

TABLE 0-3

ACCEPTABILITY OF INCENTIVE ACTIONS IN ALTERNATIVE FUTURE SCENARIOS, RELATIVE TO PRESENT

INCENTIVES:		ALTERNATIVE FUTURES:								
		SUCCESS			TRANSFORMATION			DISTRESS		
		Direction	Scores	Sum	Direction	Scores	Sum	Direction	Scores	Sum
Fund Basic Research	1980	↑	+1		↓	-1		↓	-1	
	1990	↑	+1	+4	↓	-1	-2	↓	-1	-3
	2000	↑↑	+2		↔	0		↓	-1	
Advertise Safety on Label	1980	↔	0		↔	0		↔	0	
	1990	↓	-1	-2	↔	0	+1	↔	0	0
	2000	↓	-1		↑	+1		↔	0	
Improve Registration Process	1980	↑	+1		↔	0		↑	+1	
	1990	↑	+1	+3	↑	+1	+3	*↑	+1	-1
	2000	↑	+1		↑↑	+2		↓	-1	
Encourage IPM	1980	↔	0		↓	-1		↓	-1	
	1990	↔	0	+1	*↑	+1	-2	↓	-1	-3
	2000	↑	+1		↑↑	+2		↓	-1	
Lengthen Patent Life	1980	↑	+1		↔	0		↔	0	
	1990	↑	+1	+3	↓	-1	-2	↓	-1	-2
	2000	↑	+1		↓	-1		↓	-1	

TABLE O -4

IMPACT OF INCENTIVE ACTIONS IN ALTERNATIVE FUTURE SCENARIOS, RELATIVE TO PRESENT

INCENTIVES:		ALTERNATIVE FUTURES:								
		SUCCESS			TRANSFORMATION			DISTRESS		
		Direction	Scores	Sum	Direction	Scores	Sum	Direction	Scores	Sum
Fund Basic Research	1980	↔	0		↓	-1		↓	-1	
	1990	↔	0	0	↓	-1	-2	↓	-1	-4
	2000	↔	0		↔	0		↓↓	-2	
Advertise Safety on Label	1980	↔	0		↔	0		↓	-1	
	1990	↔	0	0	↑	+1	+2	↓	-1	-3
	2000	↔	0		↑	+1		↓	-1	
Improve Registration Process	1980	↑	+1		↔	+1		↓	-1	
	1990	↑	+1	+3	↑	+1	+4	↓	-1	-4
	2000	↑	+1		↑	+1		↓↓	-2	
Encourage IPM	1980	↔	0		↔	0		↓	-1	
	1990	↔	0	0	↑	+1		↓	-1	-3
	2000	↔	0		↑	+1		↓	-1	
Lengthen Patent Life	1980	↔	0		↔	0		↔	0	
	1990	↔	0	0	↔	0	0	↔	0	0
	2000	↔	0		↔	0		↔	0	

TABLE O-5

ACCEPTABILITY AND APPROPRIATENESS OF OBJECTIVES IN ALTERNATIVE FUTURE SCENARIOS, RELATIVE TO PRESENT

OBJECTIVES:		ALTERNATIVE FUTURES:								
		SUCCESS			TRANSFORMATION			DISTRESS		
		Direction	Scores	Sum	Direction	Scores	Sum	Direction	Scores	Sum
Overall	1980	↓	-1		↑*	+1		↑	+1	
	1990	↓	-1	-4	↓	-1	-1	↔ *	0	-1
	2000	↓↓	-2		↓	-1		↓↓	-2	
Alleviate Regulatory Problems	1980	↔	0		↑	+1		↑	+1	
	1990	↑↑	+2	+4	↑/↓ *	0	0	↔*	0	0
	2000	↑↑	+2		↓	-1		↓	-1	
Safer Biologically Integrated Controls	1980	↔	0		↔	0		↓	-1	
	1990	↔	0	0	↑	+1	+3	↔ *	0	0
	2000	↔	0		↑↑	+2		↑	+1	

reversal between two time periods was indicated. The patterns shown in these tables were examined for insights into the viability of the incentives program and the incentive actions in these alternative futures. To supplement this information we included the results of SRI's analysis of some of the policy issues examined in this work. See Table O-6.

The acceptability of incentives between scenarios and in different time periods was examined. It was found that in none of the three scenarios does any incentive move in a consistent direction in all periods. Only in two cases (Safety on the Label, 1980; Improve Registration, 1990) were trends of acceptability consistent. This lack of consistency indicates that it is not possible to find a policy of incentive actions that is appropriate for all eventualities. Thus there is some risk no matter what course EPA chooses, although this risk can be reduced somewhat by watching carefully for signs that society is taking one path to the future or another. The findings for each of the five incentives examined and the EPA/ETIP program are as follows:

(1) Provide Funds for Basic Research:

Basic research is not well accepted except in an industrialized and technologically successful society. This incentive has the longest lead time before results are evident. It has conflicting acceptability among scenarios in each of the time periods (the only incentive having that extreme form of conflict). Furthermore, in the transformation and distress scenarios, the probable impacts are weaker than at present. Thus, an investment by society in basic research for pest controls is somewhat fragile, if there is some possibility that the future will have elements of the distress or transformation scenarios. If the investment is not made soon, it may not be made at all, and the longer the delay, the less promising the payoff from the research.

(2) Advertise Safety:

Advertising of safety is more or less acceptable across all scenarios, that is, enough of the population apparently desires it in almost any scenario to make it worthwhile. The impact under the transformation scenarios is equal to or greater than now, possibly because individual styles and decisions are more important. The impact in a distress scenario is low since the incentive does not lead to solution of a major problem.

(3) Improve the Regulatory Process:

This incentive shows greater acceptability in the future than now across all scenarios, but for different reasons. In the success scenario, the desire (and demand) is to help industry and technology play its part more effectively. In a transformation scenario, assuming federal regulations exist in the year 2000, improving the

TABLE O-6

POLICY ISSUES FROM SRI ANALYSIS

POLICY ISSUES:		ALTERNATIVE FUTURES:								
		SUCCESS			TRANSFORMATION			DISTRESS		
		Direction	Score	Sum	Direction	Score	Sum	Direction	Score	Sum
4. Conditions Provide Incentives for Innovation	1980	↑	+1		↓	-1		↑	+1	
	1990	↑	+1	+3	↔ *	0	0	* ↓	-1	-1
	2000	↑	+1		↑	+1		↓	-1	
5. Demand Environmentally Sound Pest Control	1980	↔	0		↓	-1		↑	+1	
	1990	↔	0	0	↓ *	-1	0	↑/↓*	0	0
	2000	↔	0		↑↑	+2		↑	-1	
7. Environmental Quality Over Economic Ends	1980	↓	-1		↓	-1		↑	+1	
	1990	↓	-1	-3	↑/↓ *	0	0	↑/↓*	0	0
	2000	↓	-1		↑	+1		↓	-1	
13. Acceptance of Flexible Policy Stance	1980	↑	+1		↑	+1		↑	+1	
	1990	↑	+1	+3	↑	+1	+3	↑	+1	+3
	2000	↑	+1		↑	+1		↑	+1	

registration process will serve small industry and agriculture more than others. In a distress scenario, improvements in the registration process are intended to help solve some of the existing problems, but as the social and political climate degrades, and faith is lost in existing institutions, there may be no need to pursue regulations. There is a reversal in the attitudes toward acceptance of the incentive over time. The impact of this incentive is at least as good as at present in the success or transformation scenarios, but there is little hope for success in the distress scenario.

(4) Encourage IPM:

In both a highly successful industrial scenario, and a scenario of industrial, political and social distress, IPM most likely will not be received enthusiastically. Similarly, the impacts will not be great. Industry might perceive IPM as a new field in pest control, or a portion of the market not yet under control and thus devote efforts to its pursuit. On the other hand, new technology may make IPM less necessary. The greater promise of acceptance and impact of IPM is in the more individualistic society, where the individuals who were transformed to exhibit the frugal nature of man can see the advantages of IPM.

(5) Lengthen Patent Life:

Only in a highly industrialized society will lengthening the patent be accepted to a greater degree than now. The effectiveness is expected to be small, in any case.

(6) EPA/ETIP Program on Incentives

We find that the acceptance of such a program is probably greatest now, under the conditions which presently exist. We attribute this to the assumption that more of society believes we still have time and methods available to solve problems of pest control cost/benefits. The split of values today is such that achievers, frugals and survivors, can see the benefits from an incentive program, and thus can support it even though their goals may differ considerably. In the absence of great food, energy, political or social crises, the public will support government programs to improve the efficiency of government, help industry meet some of its needs, and solve some public problems.

If a highly successful technical/industrial society evolves, either the problems of pest control will be solved or those who are not part of the mainstream society will have neither the desire nor power to change the system via an incentives program.

In a society which involves transition to frugal values, there will be less of a demand for a program which seeks to continue industrial development of new pest control approaches. In early years of this transition, a program of incentives aimed at meeting needs of individuals might be accepted, but as these needs change and as society changes with them, both the government structure which can create incentives as well as the benefits to be gained from such incentives will be of little importance and usefulness.

Incentive programs might be useful in scenarios in which institutional degradation and social distress are evident and could help overcome such trends. However, if external variables are strong enough to drive the society further toward the brink of social and economic disaster, incentive programs can be of no value--much more important survival and political issues will consume the energies of the public.

The individual objectives of the EPA/ETIP program may have somewhat different public acceptance than the concept of the incentive program itself. For example, alleviating the problems of regulation will be highly acceptable in a technological/industrial society, but it is doubtful that in such a society pesticide regulations which pose significant problems for industry would exist. Assistance in the development of safer, biologically integrated products can have greater acceptance and impact in the transformation scenario than in other scenarios.

In general, an incentive program will have less importance, less acceptance and less impact if technology is readily available to meet the problems of pesticide use. Where major societal changes take place rapidly, long-term programs--e.g., incentives for R&D of new pesticides which cannot be expected to give results for at least ten years--will have less acceptance than at present.

(7) General Results and Conclusions

In addition to analyzing the impact of an individual incentive under different scenarios, we also examined the effect of all the incentives in a particular scenario. The success scenario showed no reversals of acceptability or impact of incentives, and the program objectives and related SRI issues also displayed no reversals. The transformation and distress scenarios, however, which reflect substantial shifts in economic and social conditions and public attitudes, indicate reversals in the acceptability of the program objectives and in some public attitudes important to pest control innovation. This indicates that in a success scenario any initial movement in the acceptability of an incentive action will be a good predictor of its acceptability in the long term (to the year 2000). However, the context of public attitudes that affect environmental and innovation issues could shift severely over the next 24 years if prevailing conditions are significantly different from the industrial success scenario. That would make future decisions about particular incentives more difficult and less certain.

A subjective ranking of the acceptability of the five incentives examined places them in the following order at present: changes to the registration process, advertising of safety on the label, funding basic research, promotion of IPM, and lengthening patent life. Likely shifts in that ordering were examined in the three time periods in the three scenarios. It was found that no substantial changes in the ordering could be expected; that no incentive would be likely to shift in this ordering by more than one place up or down. Further, the incentive with the most acceptability now (changes in the registration process) would never be moved out of its position of primacy.

The IPM incentive, the program objective dealing with the promotion of biologically-integrated controls, and the policy issue dealing with the demand for environmentally sound pest control move in complementary and parallel ways in the success and transformation futures. In the distress scenario, however, the public attitudes toward the program objective and the policy issue shift in opposite directions, and are at odds with the consistent diminished acceptability of the IPM incentive action.

Some light is shed on this apparent anomaly when the issue dealing with conditions providing incentives for innovation is compared with the acceptability of the overall program objective. In the success and transformation scenarios, these move in appropriately complementary directions. That is, when conditions are conducive to innovation, the public's perceived need for the incentive program is less, and vice versa. But in the distress scenario, with all its confusion and breakdown of social and economic systems, society's needs, capabilities and resolves could be seriously out of synchronization. Thus, in this scenario, conditions become less and less conducive to innovation in pest control, and the same conditions cause society to become less willing or able to undertake incentive actions to compensate. So, if the future resembles the disarray of the distress scenario, rationality and order in government planning decisions may be subordinated to the exigencies of the moment.

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-540/9/77/009	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE INCENTIVES FOR RESEARCH AND DEVELOPMENT IN PEST CONTROL VOLUME II APPENDICES		5. REPORT DATE DECEMBER 1976
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) WECHSLER, HARRISON, BURG, GIBBONS, PERWAK, TERRY.,		8. PERFORMING ORGANIZATION REPORT NO. 78167
9. PERFORMING ORGANIZATION NAME AND ADDRESS ARTHUR D. LITTLE, INC. Cambridge, Massachusetts 02140		10. PROGRAM ELEMENT NO.
		11. CONTRACT/GRANT NO. 68-01-3133
12. SPONSORING AGENCY NAME AND ADDRESS Office of Pesticide Programs Strategic Studies Unit U.S. Environmental Protection Agency Washington, D.C. 20460		13. TYPE OF REPORT AND PERIOD COVERED Final
		14. SPONSORING AGENCY CODE EPA/500/01

15. SUPPLEMENTARY NOTES

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16. ABSTRACT

This program identified, developed, and evaluated incentives (externally applied influences) that the federal government can offer to reduce barriers to innovation and thereby encourage the continued development of pest control methods by industry. The history of pest control innovation was analyze, and influences on current decision-making concerning industrial pesticide R&D were studied to provide background for the development of incentives. Then, 64 preliminary incentive ideas were devised and evaluated in accordance with a conceptual framework. These incentives were screened and ranked according to their feasibility, the acceptance by parties involved in their implementation, and their potential contribution to realizing the objectives of this program. Nine particularly promising incentive areas were developed further and evaluated in several possible future scenarios. Recommended incentives included specific actions designed to decrease regulatory hindrances to R&D, reduce the risk of product development by industry, increase the availability of minor use pesticides, lengthen patent life, advertize safety on the product label, increase utilization of Integrated Pest Management, and increase information and training for pesticide users. The insights and comments of representatives of the pesticide industry and government staff concerned with pesticide development and regulation were sought at several stages in the development of incentives.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Regulation Environment Pesticides Research Patents Toxicology	Crop groupings Minor Use pesticides Integrated pest management Regulatory hindrances Alternative futures Enterpreneurial risk Product testing Information and training Product labeling R&D incentives	06/F 06/J 14/F 05/C 07/A 02/B

18. DISTRIBUTION STATEMENT Release Unlimited	19. SECURITY CLASS *(This Report)* Unclassified	21. NO. OF PAGES 235
	20. SECURITY CLASS *(This page)* Unclassified	22. PRICE

EPA Form 2220-1 (9-73)